

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Trade Press Publishing Corporation

542 South Dearborn Street, Chicago, Illinois

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Do You Feel the Same Way?

"I WANT to say how well I personally enjoy Liman Sandrock's 'Quarried from Life' page in ROCK PRODUCTS. Good, wholesome news of this sort, written in a spirit of fun and at the same time interspersed with enlightening information, add zest to your magazine and bring us all closer together in good fellowship. Keep it up."

This is what George E. Schaefer, district sales manager of the General Crushed Stone Co., Easton, Pa., says of one editorial department of the magazine about which dozens of readers have commented favorably since it was started a few months ago. If you haven't been enjoying the fun and humor, as well as the serious and interesting facts of these pages, you have missed a lot. Now is a good time to commence reading it. "Quarried from Life" in this issue appears on page 40.

* * *

Any Questions to Ask?

QUESTIONS of all sorts pertaining to production, equipment, design, and marketing of rock products reach ROCK PRODUCTS' editors every day. Not always is it possible to answer comprehensively or in the way the editors should like to the questions which are received. Some requests for information would require a month's time of a consulting engineer to answer; some which involve a matter of opinion rather than of fact it would be unfair to attempt to answer. But hundreds of questions coming from individual producers are of equal interest to hundreds of other producers, and to give all readers the value of the answers a new editorial department has been established in ROCK PRODUCTS where the questions and answers will be published in each issue.

This department will add one more service to the many which ROCK PRODUCTS now affords to its readers, and is an expression of the desire to provide the utmost in value at all times to all readers. Without doubt this new department will be just as popular, in a different way, as "Quarried from Life" has been. The first appearance of the "Questions and Answers" department is on page 38 of this issue.

* * *

Popular Pages

PROBABLY no existing department in ROCK PRODUCTS is more popular or considered more valuable among a majority of readers than that entitled "Hints and Helps for Superintendents." Handy, helpful plans showing how home-made kinks have prevented delay, saved expense, kept equipment out of the scrap pile, or made plant operation more efficient at other plants are eagerly read by the practical men who keep their plants running both effectively and economically. "Quarried from Life" is making its reputation. "Questions and Answers" is almost certain to become popular with readers; but "Hints and Helps for Superintendents" is an editorial department on which hundreds of operators count definitely to save many dollars, perhaps hundreds of dollars, every year.

Plant operators and superintendents are urged to send to the editors descriptions, drawings, and photographs of plans they have worked out which would be suitable for the "Hints and Helps" pages. The editors are always glad to pay for such items which can be published on these pages.

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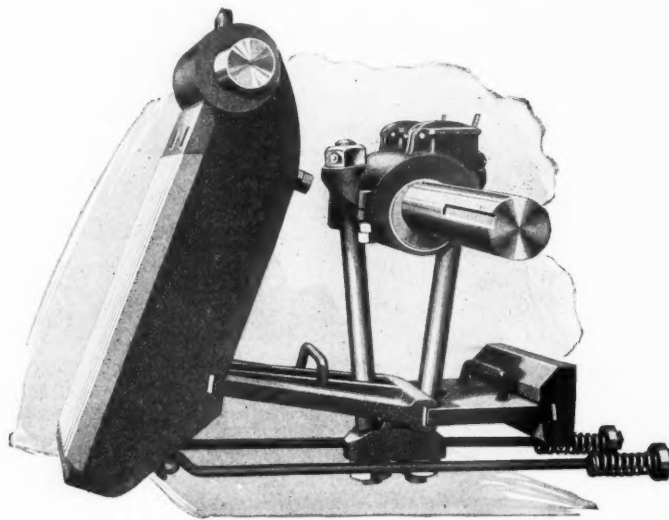
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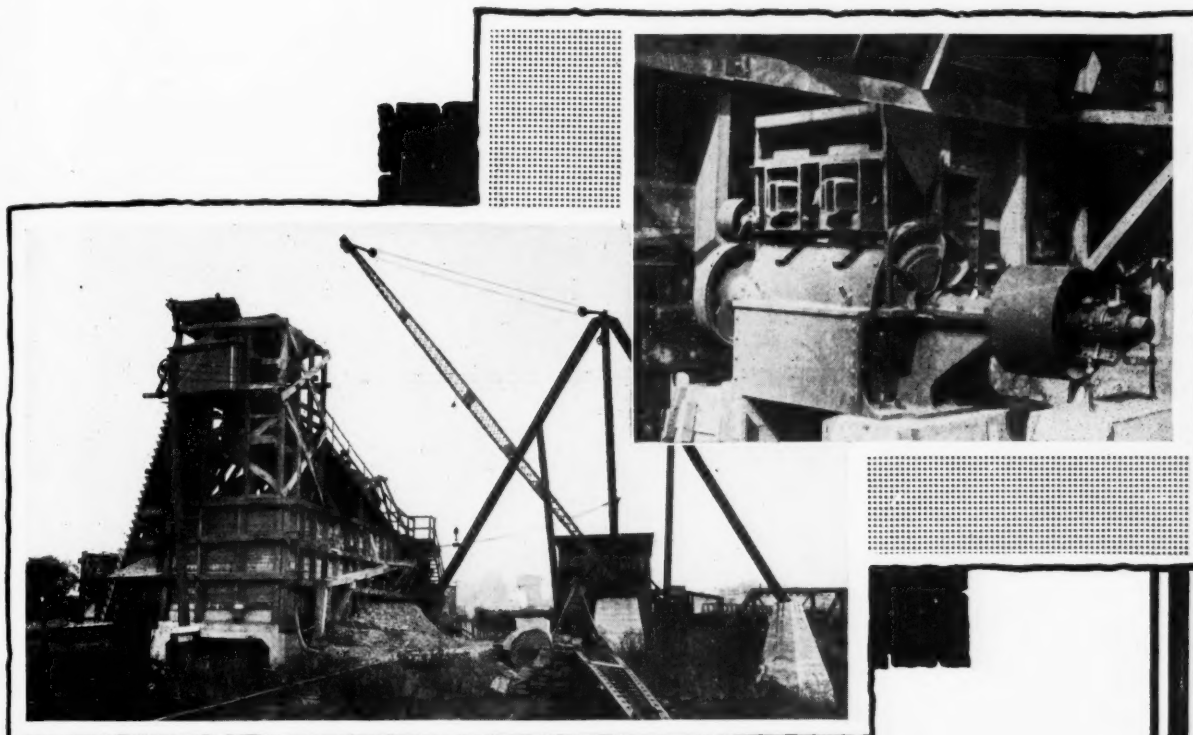
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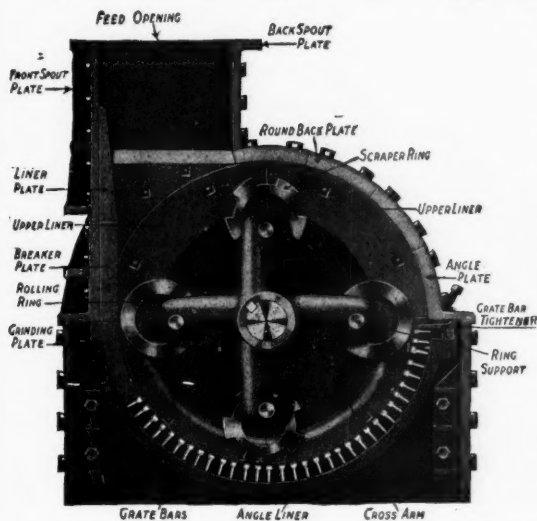
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The Southern Sand, Gravel and Supply Company, operating a plant along the banks of the Sciota River in the heart of Columbus, Ohio, **manufacture** sand with an American Ring Pulverizer.

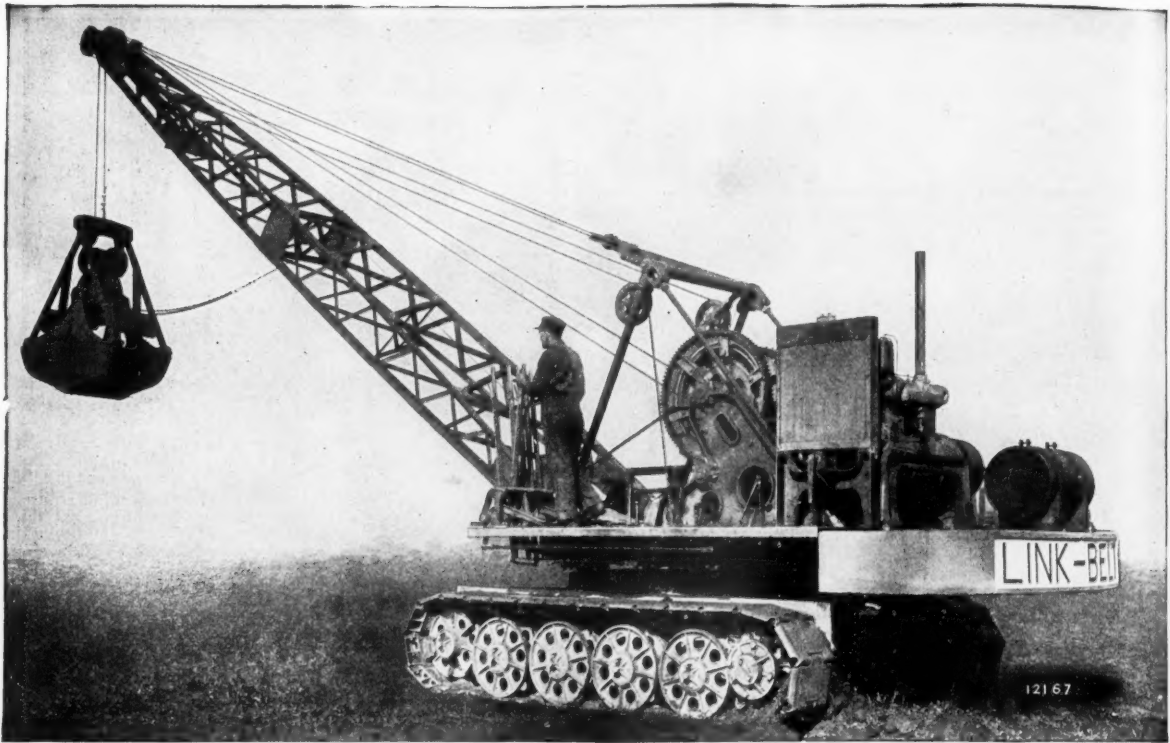
The 1/2-in. material or pea gravel is spouted direct to the pulverizer run by a 75-h.p. motor, and the pea gravel is converted to 1/16-in. sand.

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The New Link-Belt Crawler Crane

A Sturdy Reliable Machine For All-Around Service

THE new Link-Belt Crawler Crane is built to the high standard of quality characteristic of all Link-Belt products.

It can operate with a hook-block, grab bucket, drag-line bucket, skimmer bucket, steam shovel attachment, electric lifting magnet, wood grapple, or pile driver attachment. It weighs 22 tons and can lift 10 tons at 12 ft. radius, or 3 tons at 30 ft. radius. The standard boom is 35 feet long.

The crane rotates four complete revolutions per minute, travels three-quarters of a mile per hour, and can easily climb a 20 per cent grade.

The crane is a one-man machine, because steering of the caterpillar truck is controlled in any position of the upper rotating base by a lever at the operator's stand in the cab. Complete specifications, price, and delivery upon request.

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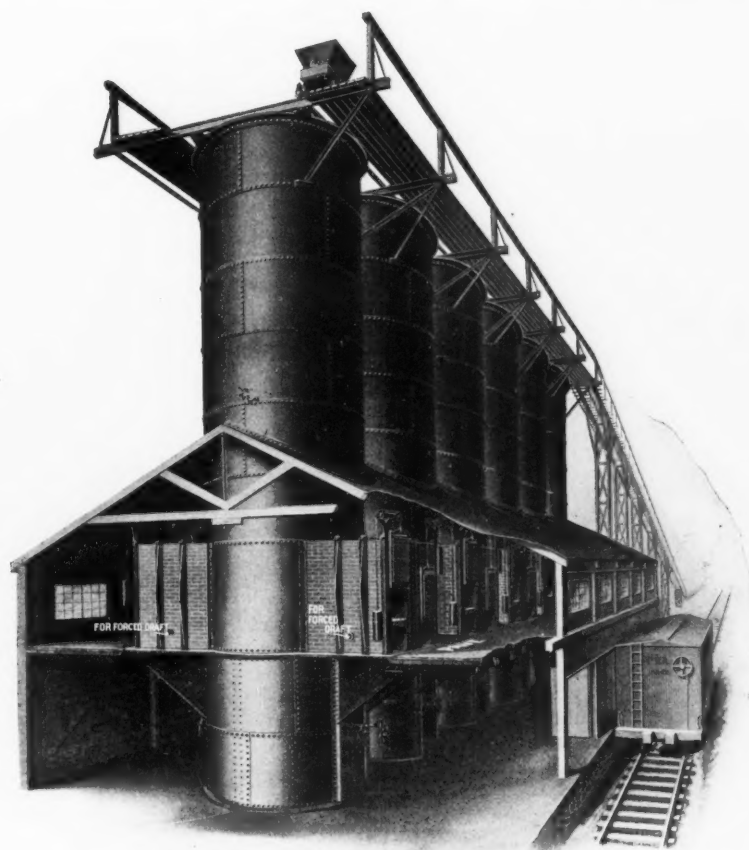
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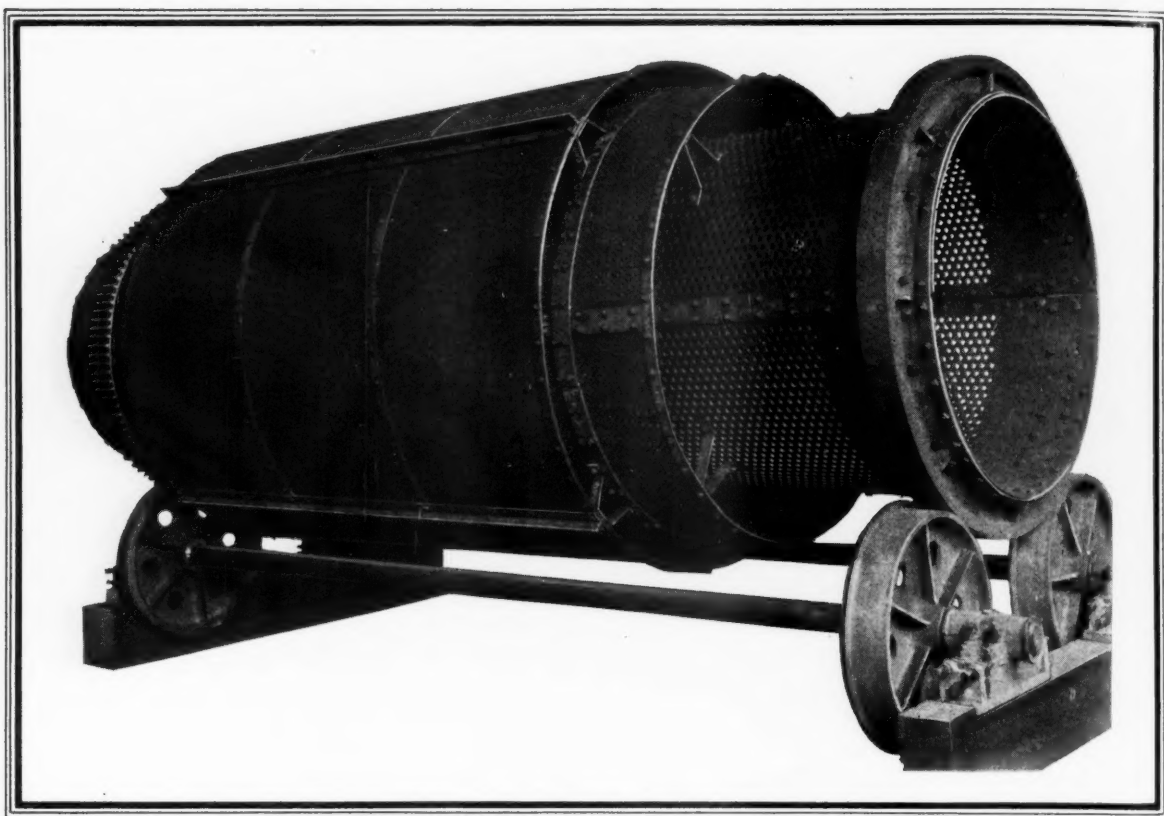
The Steacy-Schmidt Manufacturing Co. manufacture both the Keystone vertical kiln and rotary lime kiln. They recommend the kiln best suited for the purpose.

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Keystone Lime Kilns

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Webster Revolving Screens are built in many styles and sizes with capacities to suit the individual installation. They can be equipped with screen plates which have round, square, oval or staggered perforations, depending upon the material to be screened.

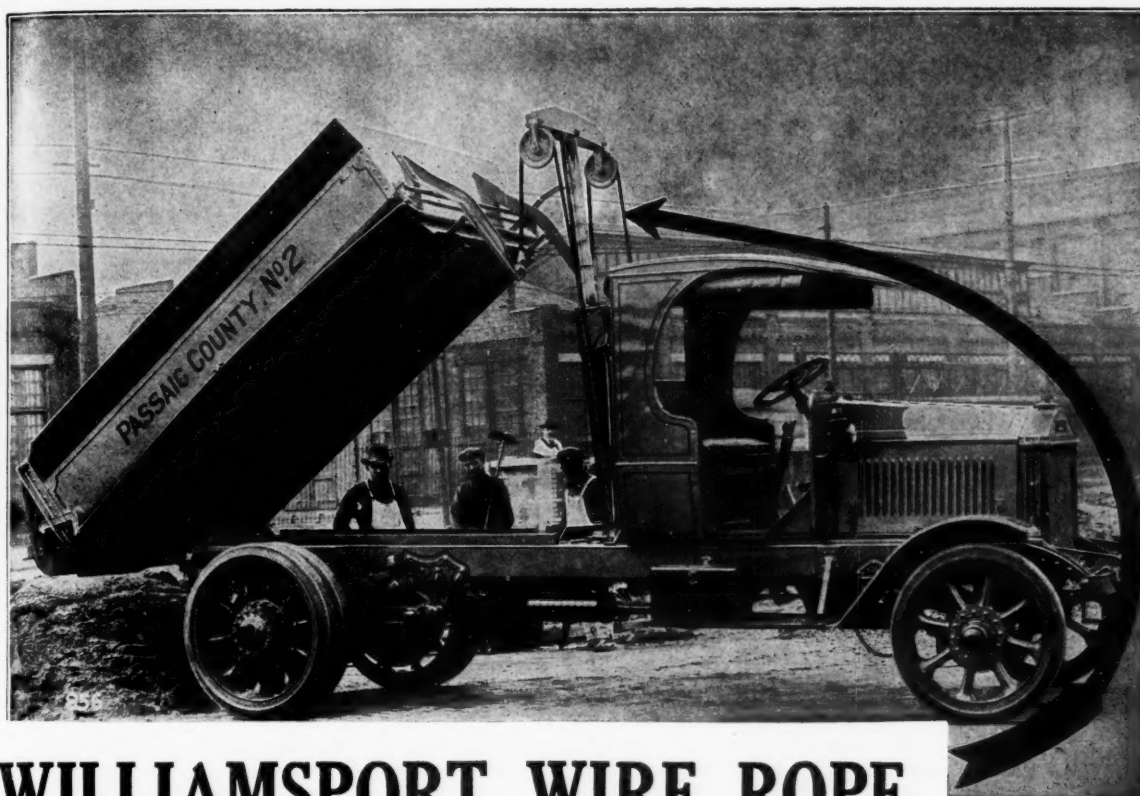
Let our Engineers help you in the selection of proper screens, and screening machinery. They are at your service

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The only ropes made containing the Telfax Marker.

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Rope

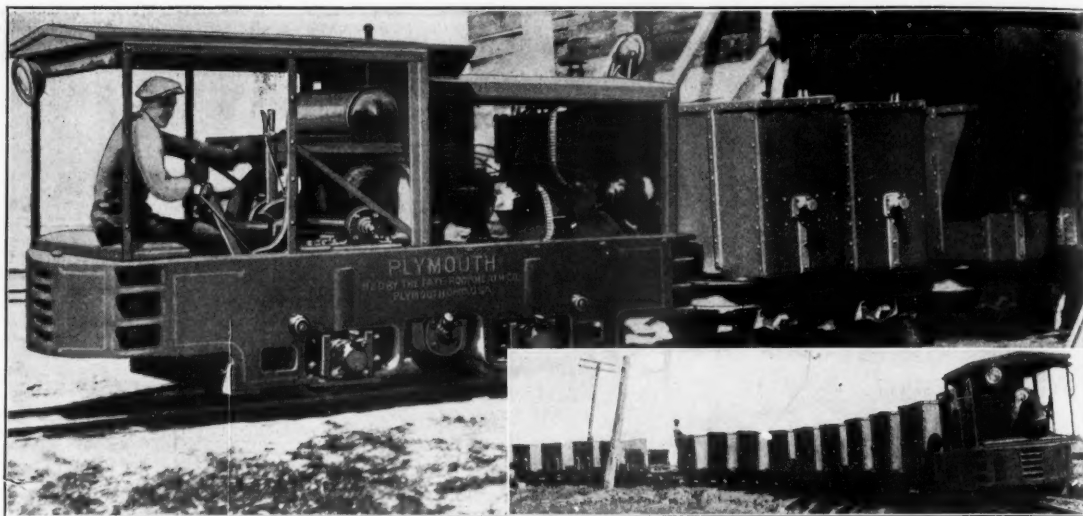
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Des Moines, Ia., Oct. 2, 1922.

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

You are at liberty to use these photographs of our work on which two of your six-ton Gasoline Locomotives were used.

My company has two of your PLYMOUTH three-ton locomotives which are used on bridge work and one six-ton Gasoline Locomotive which is now used for switching standard gauge cars and for the haulage of light equipment at our gravel plant at Bellevue, Iowa. The six-ton Locomotives were originally used for concrete work.

All the locomotives have given good satisfaction. The repair costs have been low and we have always found The Fate-Root-Heath Company to be courteous and fair in all their dealings with us.

Yours very truly,

(Signed) George W. Koss, President and General Manager.

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THE FATE-ROOT-HEATH CO., Plymouth, Ohio

PLYMOUTH

Gasoline Locomotives

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Rock Products

Volume XXV

Chicago, November 18, 1922

Number 23

Changes Which Made a Plant Efficient

To make an effective plant by economic changes on an old foundation is not the easiest task in the world. The general manager of this plant tells how obstacles have been overcome here and the plant put on a paying basis, producing more with fewer men

By William J. L. Roop

Vice-President and General Manager, New England Sand and Gravel Co.

FOUR years ago the plant of the New England Sand and Gravel Co. could hardly have been called efficient. For one reason and another, production was low and frequently interrupted, costs were high, and in general the plant was not what could have been called a successful one at that time. Through a number of changes which

cent more men to produce in 16 hours as much as we are turning out now in eight hours, and at the present time we have 12 men and a plant superintendent.

Our operation is a dredging one. The changes which have put us on our present day basis began right at the dredge; let us take them up at that point.

result that the line was frequently plugged and there was much loss of time on this account. To overcome this defect, a special eight-arm spiral cutter was designed with a maximum opening between the blades of 8¼ in. No stones large enough to block the 12-in. line can pass between the blades of this new cutter. At the same



Three men were eliminated by changing the screens from the small house at the left to the top of the main plant and installing a booster pump to elevate the gravel and water before screening

have been made since that time we have put the plant on a paying basis, and though the plant is still basically an old one, the remodeling has made it into one of which we are rather proud.

Formerly it took on an average 75 per

In the first place there used to be a six-arm cutter driven by a 25-hp. constant speed motor. This drive lacked flexibility, and the openings between the blades of the cutter were so large that they permitted oversize stones to enter the line with the

time the drive was changed to a 40-hp. variable speed reversible motor giving a range of 7 to 15 r.p.m. on the cutter head. The reversible motor also permits the cutter head to be driven backward to clean it of hard clay into which it may get started.

The ladder or cutter frame was formerly attached to the dredge by a ball joint below the water line. This made it difficult to get at the suction line for making changes or repairs, so now the ladder has been hinged to the deck above the water line, the ball joint eliminated, and a flexible suction hose substituted. The illustration shows how the ladder is attached to the dredge as at present.

Square spuds were formerly used for anchoring the dredge, but they did not work well at all; square spuds seldom do work well with this type of dredge. So we put in round spuds and a spud gantry, with a new hoist, to replace the old block and fall on the nigger head.

The control and resistance equipment for the main motor on the dredge has been changed from constant duty to intermittent duty, and this makes it possible to vary the speed of the main pump when it is desired to do so and eliminate much electrical trouble.

At the present time the pontoon line of 12-in. pipe extends about 1600 ft. from the booster pump to the dredge. We are using the Parker ball joint for a majority of joints on the pipe line. This eliminates the rubber sleeves and in this way cuts down friction within the line, saving considerable money and labor in replacing the old rubber sleeves.

In the earlier plant all the screening and crushing used to be carried on in the small



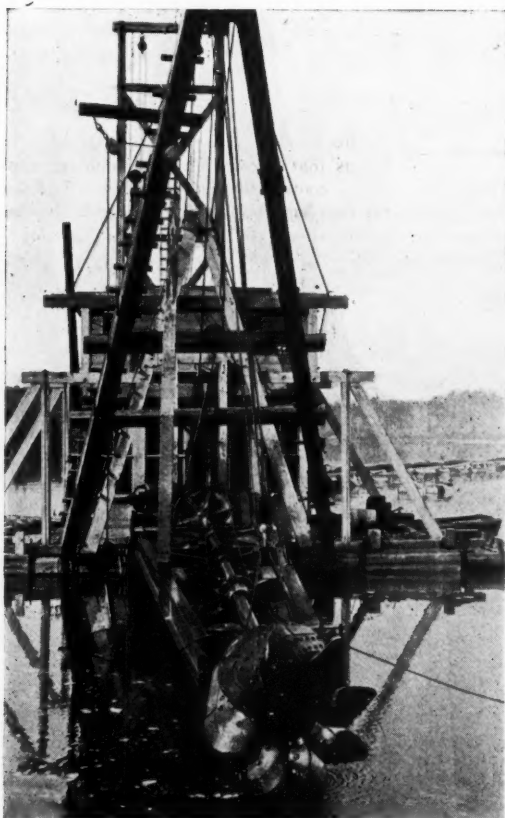
Part of the main pump and its 250-hp. motor, with the smaller motor above to handle the spuds

house shown at the left of the illustration at the beginning of the article. The pipe line discharged to gravity screens, and the sized material was carried by two belt conveyors up through the covered gallery to the top of the main plant where it was distributed into bins over another set of screens. This

old method required four men at the discharge house. We have now substituted a 250-hp. motor driving a pump exactly like the one on the dredge, and this booster pump raises the material through a pipe line in the gallery to the top of the plant, where gravity does all the work of screening, separating the sand, and distributing the sand and gravel into bins. We now have one man at the pump where we had four when we used conveyors, and while we spend nearly as much for the additional power as we have saved in labor costs, the plant is much more effective in its present form, and maintenance has decreased considerably.

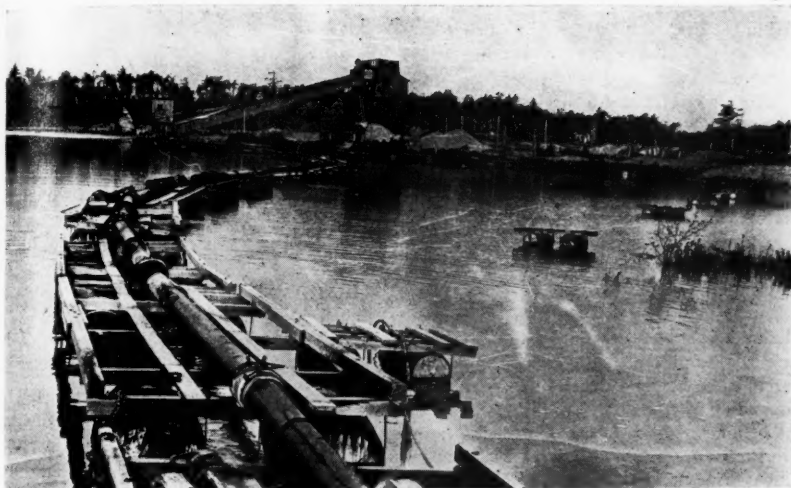
This booster pump has two special features which are worth mentioning. We designed a special stone box which is really large enough to enable the men to work conveniently at the pump in case of trouble. The ordinary stone box is much too small, and when repairs are necessary far too much time is lost because the repairs cannot be made conveniently. The illustration shows the stone box we are using. The second feature is a small 2-stage high pressure pump forcing water at 75 lb. through a 2-in. pipe into the main pump on the opposite side from the intake. This counteracts a good deal of the pressure of the incoming material and saves a great deal of wear on the impeller shaft.

At the top of the screening plant the material elevated by the booster pump discharges to a fanning table 73 ft. above the



TWO IMPORTANT DREDGE CHANGES

The old 6-arm cutter used to permit large stones to enter and clog the pipe line. Many dredging authorities said this new specially designed 8-arm cutting head shown in the illustration at the left would reduce the flow through the line too much, but it works well and almost entirely prevents clogging. The ladder was difficult to get at for changes or repairs when it was attached to the dredge by ball and socket joint below the water line, so it has been hinged to the dredge above the water line, as shown above, and a flexible suction hose substituted

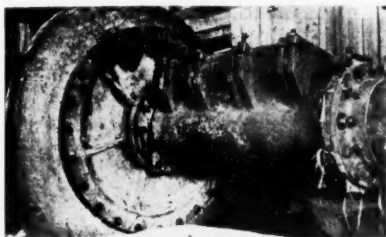


Electric cable will often get twisted and sometimes a strand broken, and when it is laid on the bottom cable repairs mean quite a delay. Trouble has been eliminated by laying the cable over the line of buoys shown at the right

pump. A 90-deg. bend with a flanged nipple cut at 45 deg. and attached to the pipe has been found to work successfully in spread-

Buchanan jaw crushers and is dropped into the bins.

There are three banks of the gravity



The ordinary stone box is too small to make repairs easily; this one was specially designed and constructed for this plant

ing the material evenly over the fanning table.

The material drops from the fanning table on a bank of stationary screens. The sand and water passes through the first of these screens, with $\frac{1}{4}$ -in. mesh, into a specially designed settling tank. Here the velocity which the material has gained in transportation is counteracted on another table and two grades of sand are separated from the water and dropped by gravity into bins over the loading track. The settling tank is 22 ft. long, 14 ft. wide at the top and has 45-deg. sides. The sand and water discharges into one end of this tank and the coarse sand, which settles at a greater rate than the fine sand, settles in the first half of the tank, while in the second half the finer sand comes down. A man operates the sliding gates in the bottom of the tank to discharge the sand into the proper storage bins.

The screened concrete gravel and roofing gravel sizes come directly off the gravity screens into the bins. The oversize from the $\frac{1}{4}$ -in. screen goes into two 12x20-in.

NO SHUT-DOWNS HERE

This plant keeps in readiness a complete supply of extra equipment, from bolts to a brand new 250-hp. motor. A lot of money is tied up as a result, but it's almost impossible for a breakdown to put the plant out of business more than a few hours. The operating time saved is worth many times carrying charges of the extra equipment.

screens, $\frac{1}{4}$ -in., $\frac{1}{2}$ -in., and $\frac{3}{4}$ -in., and each bank has 360 sq. ft. of screening area. Two aprons hung in front of the screen serve to retard the gravel and prevent it from



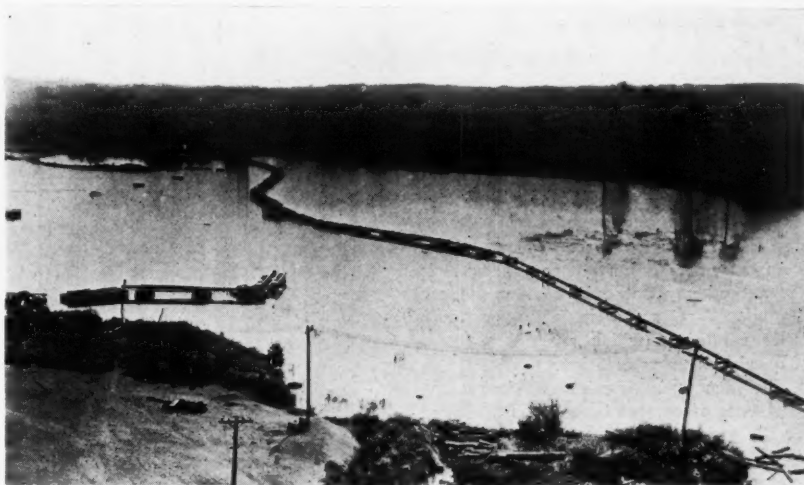
The incoming pipe at the left, the pump house and pipe line gallery, and the waste water flume at the right, appear this way from the top of the plant

throwing over from the velocity it gains on the inclined screens.

This in brief is a description of the present operating methods as they differ from the older and less effective methods.

Our operating capacity is about 125 tons per hour, and we maintain that speed pretty regularly. A large part of this steady production is due to the fact that we keep on hand a complete set of spare parts and equipment at all times. We have a spare main pump, a brand new 250-hp. motor ready to be installed at a moment's notice, and a complete set of gears, shafts, cutter blades, parts for the ladder, connecting sleeves, and all sorts of bolts and miscellaneous supplies.

This stock of material is expensive; it means that a considerable amount of capital is continually tied up, but we look on the carrying charges of that extra material as insurance, and the best kind of insurance.



The pipe line extends at present about 1600 ft. from the booster pump to the dredge

This matter of spare parts we consider a very important one, and I believe that when a sand and gravel operator becomes alive to the need for carrying a complete supply of spare parts he will be well on the road to lower costs and larger profits. A plant which operates only 70 per cent of the time cannot make as much money as though it were operating 95 per cent of the time.

Not only do we have complete sets of parts but we have a special stock room which without question increases the efficiency of the entire plant. Instead of jumping into a car and riding several miles for some special bolt when we need a new one, all we have to do now is to go in the stock room and take it out of the proper compartment and we have saved several hours when, perhaps, the plant would have been entirely shut down. By arranging the stock in shelves and bins the entire extra supply

takes up only a small amount of room, and without question it has saved us many hundreds of dollars in valuable operating time.

All material and supplies are charged to the stock account at the time they are purchased, and are drawn on requisitions approved by the plant superintendent. A duplicate of each requisition is forwarded to the main office bookkeeper who credits the stock account and charges the proper plant account, taking the cost from the perpetual inventory.

Such is the plant as it is today. If it should be suddenly and completely destroyed and we could replace it with a plant designed from start to finish for the most effective operation, we could without doubt produce a better plant than this re-made one, but for an old plant which has been changed in as economical a way as possible, I believe we have one that is truly efficient.

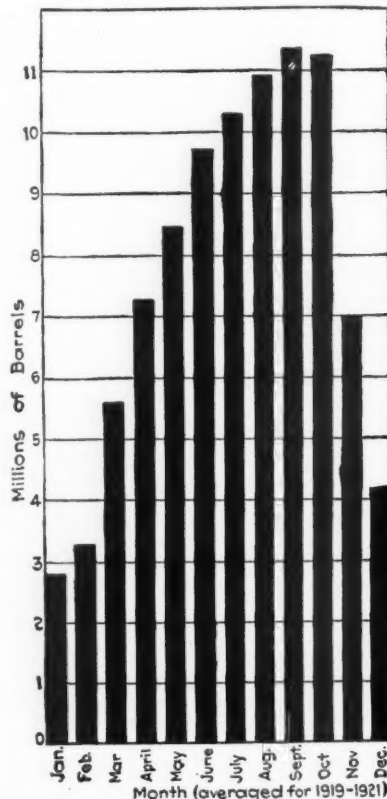
Cement Demand Taxes the Transport Facilities

SEASONAL demand, governed largely by activity in the building and general construction industries which is always greatest in the warm months, is a controlling influence in cement shipments, writes L. R. Burch of the Atlas Portland Cement Co. in *Engineering News-Record*. To move this year's cement production, estimated at 120,000,000 bbl., about 600,000 cars are necessary, not including those required for coal and other materials used in the process of manufacture. Of this total almost 40 per cent, or 240,000 cars, must be moved within a period of 90 to 100 days—from the latter part of July to the beginning of cold weather. This short space of time constitutes the neck of the bottle and, unfortunately, it occurs at the season when the railroads are called upon to carry the heaviest traffic.

Furthermore, because the raw material, called "cement rock," from which portland cement is manufactured, can be found only in certain sections of the country, portland cement mills are frequently grouped, a circumstance which adds greatly to the burden of the railroads. Were the plants distributed over a larger area the tension would be relieved. This is an extremely important fact, because it has a tendency not only to increase car shortages, but result in embargoes and other conditions which are the outcome of overladen transportation.

The accompanying chart shows the shipments of cement by months averaged for the years 1919, 1920 and 1921. From the low level of less than 3,000,000 bbl. in January it reaches the peak of over 11,000,000 bbl. in September and October,

dropping off sharply in November to less than 7,000,000 bbl. Upon the ability of the cement companies to meet this peak demand depends, to a great extent, their



Average monthly shipments of portland cement in U. S., 1919-1921

year's profits. They plan to have their stocks and their production in such shape as best to handle the problem. In fact, their whole operation might be said to be regulated with this condition in mind.

With traffic conditions such as have existed in the past few years it has been impossible for the railroads to handle the volume of business that is thrown upon them. If the cement peak came when freight shipments were light it could be done, but just when the construction job needs building materials the farmer also needs cars to move his crops.

The cement manufacturers would be more than glad to correct such a serious evil in their business, for it is expensive from many different angles. But they cannot correct it. They cannot do more than make helpful suggestions.

This is their suggestion: Inasmuch as car shortages and railroad congestion will be with us until the railroads are able to get back on their feet, transportation facilities must be used while they are available. This means that every effort must be made to get shipments out during the winter, spring and early summer. To do so may entail some inconvenience and some expense, but neither is commensurate with the losses that result from delays apt to occur later on. Co-operation of the various branches of the construction industry toward the elimination of the peak load, by spreading shipments more evenly throughout the year, would mean a vast saving to everyone concerned.

Duty on Canadian Cement Imports

THE U. S. Treasury Department, pursuant to the permission granted in the retaliatory clause of the current tariff act, has issued instructions to collectors of customs to collect a duty of 8 cents per 100 lb. on Roman, portland, and hydraulic cements imported into this country from Canada.

The act puts cement on the free list, but has a further proviso "that if any country, dependency, province or other subdivision of government imposes a duty on such cement imported from the United States, an equal duty shall be imposed upon such cement coming into the United States from such country, dependency, province or other subdivision of government." In the general tariff laws of Canada, cement is taxable as follows: "Cement, portland and hydraulic or water lime in barrels, boxes or casks, the weight of the package to be included in the weight for duty; British preferential tariff, 5 per cent; intermediate tariff, 8 per cent; general tariff, 8 per cent."

In the last few years the greater proportion of foreign cement imported into this country came from Canada, but the total imports are small compared with the amount made in this country.

Screens for Washing Plants

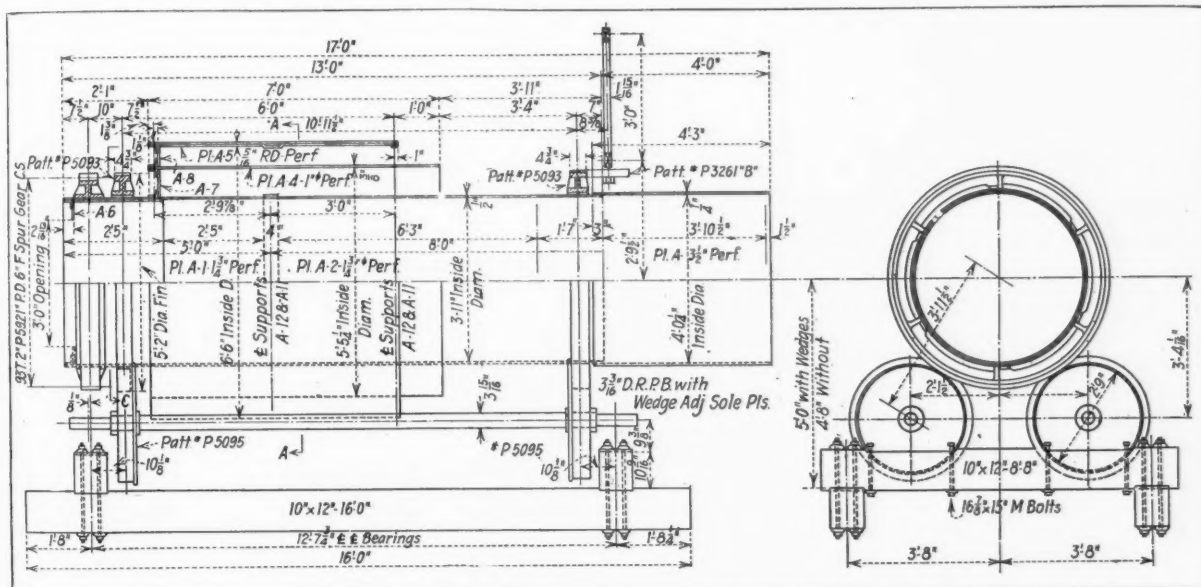
By Edmund Shaw
Consulting Engineer, Chicago, Ill.

No. 3—Revolving Screens and why they are the preferred type in washing plants. Mr. Shaw explains their principles of operation and describes some unusual forms

THE previous installments of this series, published in ROCK PRODUCTS October, 21 and November 4, dealt with the stationary screen and its principles of operation. They showed that short and wide stationary screens are more efficient than the long and narrow form, that the opening of the screen should be a slot with the longest dimension set in the direction of the flow, that punched

number of shapes. The writer's observation is that the conical form is the one most in use in the sand and gravel industry, but in other industries which use screens, such as rock crushing, ore concentration and coal washing, the cylindrical form seems to be preferred. Prisms and pyramids, either six or eight-sided (Fig. 9), were once used a great deal with fine screens, but one rarely

large and heavy screens are driven by a circumferential gear. This type, shown in the illustration, is called the trunnion screen, and it has two or more heavy steel tires around it, which rest on small wheels, called trunnions, while other wheels bearing on the side of the tire prevent the screen from sliding down in the direction of the slope. If the face of the tire and the trunnions



A simple, rugged trunnion screen. (Designed by Frank M. Welch, of the Greenville Gravel Co.)

plants make the best screen fabric for stationary screens, and that the pitch or angle of the screen is the most important factor of the screen's efficiency.—Editors.

Revolving screens are more used in washing plants than any other type, and the reason is, probably, that they are not only good screens but good scrubbers. The feed is turned over and over on its passage through the screen, scouring the surfaces of the grains and rubbing off the adhering clay. The "scrubber," which is made and sold as such, is only a revolving screen blanked off, with special baffle arrangements to hold a deep bed so that more scrubbing will be done than in the thinner bed of a screen.

The revolving screen has been made in a

sees them now. The advantage of these six and eight-sided forms was that they were very easily repaired, as the screen cloth was on steel framed panels and it was a simple matter to change a panel when the cloth in it was broken.

Spiral screens and such special forms as the King screen, which will be described later, have never become very popular outside of the ore dressing field in which they were developed. The same is true of the belt screens, like the Callow, which may be classed with the revolving screens, since the action is like that of the outside fed trommel.

The power to drive a revolving screen is usually applied to a central shaft, but very

are kept at the proper bevel these guard wheels have little or nothing to do, but they should always be used as precautionary measure. In older types of screens of this kind the gear is placed at the end of the screen, but more modern practice puts it at the point where the load is heaviest. For large and long screens with heavy loads, this trunnion type is by far the best, both from the standpoint of construction and operation.

Efficient Methods of Support and Drive

In some rare instances the trunnion type of screen has been driven by a belt, taking the power from a pulley on a jack shaft, a

blank space on the screen serving as the driven pulley. A method somewhat resembling this is to hang the screen in loops of wire rope, the rope resting in tires on the screen which have V-shaped grooves to retain it. The other (upper) end of the loop hangs on a grooved pulley on the driving shaft. The advantage of this method

Amount of Slope Important

The amount of slope to be given a screen is a matter of considerable importance, for it is possible to give so much slope that the revolutions of the screen will hardly affect the travel of the grains, which will simply slide down as over a stationary screen. If the slope is too flat the path will

slide better on punched plate than on wire cloth, for example.

Taking all these matters into consideration, all that can be said about the best slope to use is that it will be found somewhere between 10 and 14 deg. from the horizontal, and it is the writer's observation that more screens have too little slope than too much. Some of the best working screens which he has seen in sand and gravel plants had a slope of 3 in. to the foot, and this is practically a slope of 14 deg.

It used to be common practice, where a series of screens were in use, to flatten the slope on the finer sizes, with the idea of increasing the length of the helical path and consequently the number of holes over which a grain had to pass. But this, as has just been noted, caused a deep bed to build up and spoil the work of the screen. Much more feed could be put through without the bed being more than a few grains deep by increasing the slope, although to the eye the screen would not appear to be doing so much work. To show this clearly, since the matter of slope is so important in working revolving screens, a quotation will be made from an old authority, giving the amounts that may be fed to a certain screen per hour to give the same depth of bed with different slope angles (Richards, "Ore Dressing," Page 377, Volume I):

Deg.	Slope		Tons
	In.	per ft.	
2	3 1/2	+	4.6
2 1/2	1/2	+	5.8
3 1/2	3/4	+	8.1
5	1	+	11.7
7	1 1/2	+	16.5
9 1/2	2	+	22.6
14	3	+	34.5

Fig. 9—Old-fashioned eight-sided screen with sliding weight to prevent blinding

of support and drive is that it can be used with screens that are partly submerged in water, and this is a very efficient way to run a screen, especially in fine screening. One of the largest plants in the Tennessee phosphate field operates a screen hung in wire loops in this way.

Screens for ordinary duty are usually fitted with central shafts which rest in ordinary cast iron boxes. The screen fabric is fastened to a frame which is supported on the shaft by a four-armed spider. The driving power is applied to a gear at the end of the shaft. This is simpler and less expensive than the trunnion support and drive, and hence is to be preferred where the size and capacity of the screen are adapted to it. In one system of screens all the screens of the series are placed on one shaft, and there is only one driving gear for the whole; this makes the simplest system of all.

All the revolving screens of ordinary forms have a pitch or slope from the feed end to the discharge end. As the screen is turned, the slope causes the feed to roll and slide down hill to the discharge, and this gives the travel of the grains over the screen a path like a helix or screw thread. Following such a path, each grain has to pass over a great many holes before reaching the discharge, and the flatter the slope, the longer the helical path and the more holes the grains will have to pass. But this does not necessarily make for better screening.

be long enough, but the grains will be held so long in the screen that they will accumulate and form a deep bed, so that a piece of undersize will have a hard time getting to the holes, as there will be so many pieces of oversize in the way. A deep bed usually means poor screening. The size of the grains and the nature of the material to be screened have something to do with the slope. Fine screens, generally speaking, need more slope than coarse screens, as fine

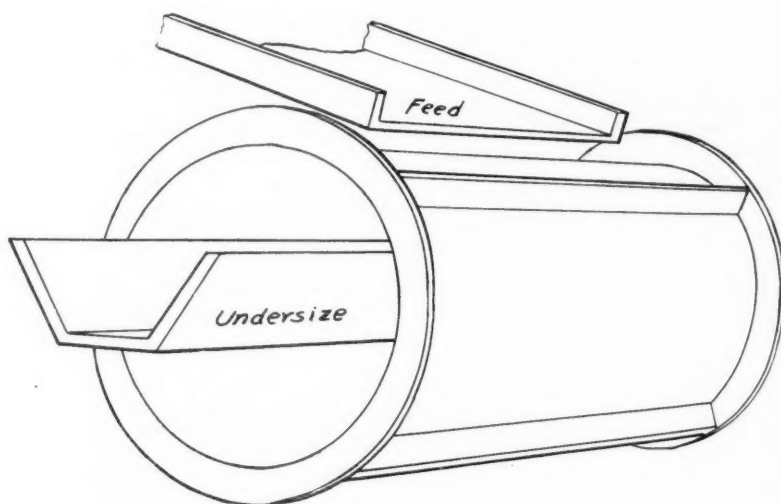


Fig. 12—An outside-fed trommel

material packs down on the screen and will not flow to the discharge end so easily, and rounded grains of any size will run better than flat grains of the same size. The kind of screen fabric used has its influence on the slope, as the material will

Thus we see that, other things being equal, we can increase the feed to a revolving screen about eight times and still keep the same depth of bed, if we increase the slope from 3/8 in. to the foot to 3 in. to the foot.

Best Speed for Screening

The speed at which the screen revolves may be increased with something the same effect as increasing the slope; that is, the capacity will be increased. But it is easy to overdo the thing in increasing the speed as a point is soon reached at which the centrifugal force holds the grains too tightly against the screen fabric, stopping the screening altogether. Nevertheless, the best speed for screening is not always that recommended by the makers, and the writer has seen a great improvement made, both in the capacity of the screen and in the quality of the

of the screen by the difficult grains, and blinding is the curse of revolving screens. The difficult grains are forced into the meshes by centrifugal force and then pounded in solidly by the large grains passing over them, so that eventually they become wedged so tightly that they often have to be broken to release them. It is with the fine screens that most blinding takes place, and with these screens there is no factor of slope or feed anywhere nearly so important as keeping the meshes open.

A great many schemes have been tried to prevent blinding, or, rather, to knock out

shaft or to the screen itself, shown in Fig. 9. As the screen revolved the weight slid out on the rod and stopped at the end with a jar that shook some of the grains out, but the jar was too light to be of much use on any but the finest mesh screen.

There has been some experimenting with automatic whips and beaters. The writer rigged up a contraption once that had some merit while it lasted. It consisted of a wooden shaft parallel to the screen on which were fastened strips of old belting that struck the screen every time it revolved. The difficulty was to get it to run slow enough, but it did quite well until it wore out all the old belting on the job. A line of beaters to be lifted up and was then allowed to fall by a strip of wood fastened on the screen, which acted as a cam, was also tried, but these, striking continually in the same place, soon broke through the screen fabric.

Recently the writer saw a device for cleaning a screen that was doing good work and did not appear to injure the screen. It consisted of a roller made of 4-in. pipe hung in swinging bearings and resting on the screen, revolving with it by friction. It is shown in Fig. 10. Another scheme which has been tried with good success is that of a revolving brush, the same as is used in rotary street sweepers. This was hung on sliding bearings and revolved by friction with the screen in the same way. Its life was given as more than a season's service, and it was very efficient in keeping the screen clean.

The way the screen is run has a lot to do with blinding and sometimes a little faster or a little slower speed will improve matters considerably. If there is a lot of heavy oversize in the screen the work will be better, as the jar from these as they pass over the fabric helps to dislodge the blinding grains. To increase this action, lifters have sometimes been put in screens. These are strips of angle iron fastened to the inside of the screen, and they lift the material a short distance and then let it fall to the bottom, giving a considerable vibrating effect.

For hand cleaning a screen, one preferred method is to draw the edge of a shovel the length of the screen. The shovel soon becomes worn to the curve of the screen and covers more territory each time it is drawn back and forth.

All sorts of screening material from silk bolting cloth to iron bars are used in revolving screens. In washing plants punched plates seem to be the favorite for the coarser screens and woven wire for the finer screens. This would seem to be good theory as well as good practice. Usually the screens are all of the same size and revolve at the same speed, and the percentage of opening need not be nearly so great for the coarse screens as for the fine, so punched plate will do. It is preferred because it lasts longer, and it is probable that round holes are more often used than square holes

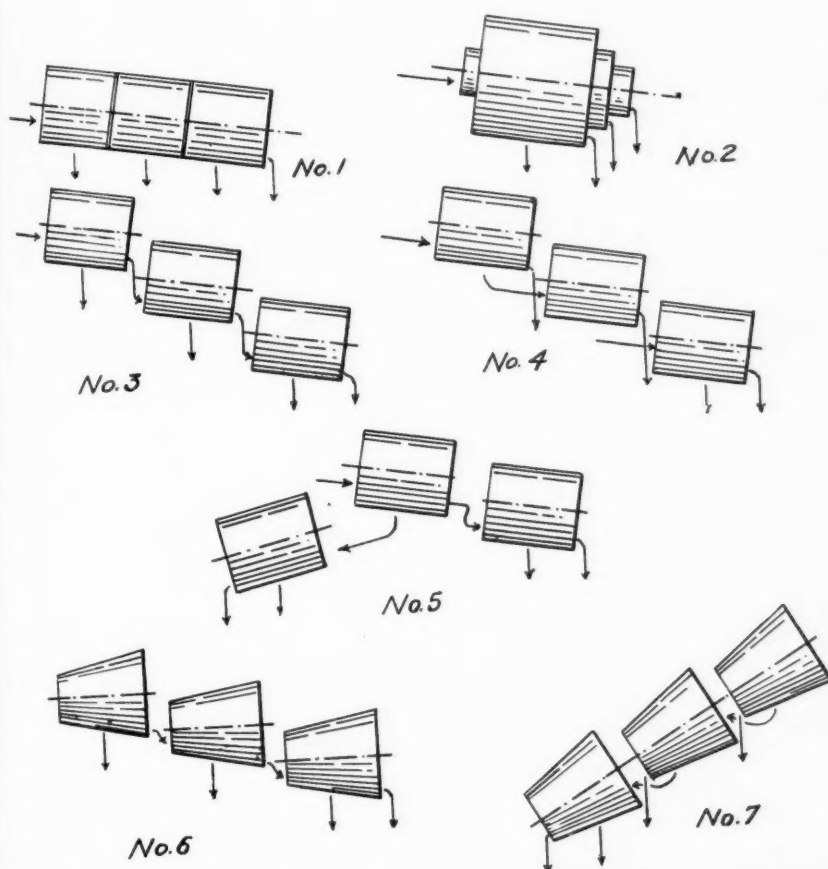


Fig. 11—Arrangements of revolving screens to produce a series of sized products

work, by merely increasing the speed of the screen.

The right speed depends upon the diameter of the screen, as it is the peripheral speed and not the number of revolutions that count. Conical screens have a varying peripheral speed at every point on their length, so in some part of the screen the peripheral speed is almost sure to be right.

Blinding the Curse of Revolving Screens

The centrifugal force, plus the action of gravity, is what causes the undersize grains to pass through the holes in the screen. But it also has a lot to do with the blinding

the grains before they became too tightly wedged in place. A method which was fairly popular 25 years ago was to place a cam on the opposite end of the central shaft from that which carried the driving gear. This cam lifted the shaft, and the screen with it, and let them drop at each revolution, causing a bump or jar that shook out the greater part of the grains sticking in the meshes. Unfortunately, the effect was also to shake up the screen and the supporting frame, too, so that something broke after a short time and the device had to be abandoned. With very fine screens a scheme that worked quite well was to have a rod with a sliding weight attached either to the

because the screen is stronger. But punched plates with square holes are used with excellent results, both as to wear and the quality of the work, in some very important plants.

Punched plates with slots do not seem to be so much used with revolving screens, but they have been so used in some cases with excellent results. At one good-sized plant, a regular study was made of the best material for the $\frac{1}{4}$ -in. screens, records being kept of the work of each. The final choice was a punched metal screen with slots arranged in herringbone fashion, as this screened the most material in the long run because it blinded less often. Probably the nature of the material has much to do with

launder or trough below the screen. But not all screens are fed this way. The outside-fed trommel, the King screen, and the belt screens put the feed on the outside of the screen and take off the undersize by a launder on the inside. The closed-end conical screen puts in the feed and takes off the discharge at the same end, but it carries the feed to the opposite end by means of an inside launder. The ordinary conical screen, with both ends open, is fed at either the small or the large end, depending on whether the screen is run on an inclined shaft or a horizontal shaft. There are advantages about feeding into the large end of a conical screen, one of which is that there is the greatest screen area where there

at the end of the first (inside) jacket, the finest at the end of the last (outside) jacket, thus reversing the method of the first system. Shown in Fig. 11, No. 2.

3. A series of separate screens arranged to take off the finest size first. Shown in Fig. 11, No. 3.

4. A series of separate screens arranged to take out the coarsest size first. Shown in Fig. 11, No. 4.

5. A compromise system, which may be used when there are more than three screens in the system. The feed is split two ways by an intermediate screen, both the fine and the coarse product of this screen being re-screened into two sizes. This system is shown in Fig. 11, No. 5.

The question of whether to take out the finest size or the coarsest size first has been much debated, but the answer would seem to depend on what was wanted in the way of products. Taking out the fine size first will usually give a cleaner coarse gravel, as what sand does not go through the finest screen is almost sure to go through the next screens in the series and be all gone when the coarsest size is reached. But taking out the coarse first makes for better screening on the fine sizes, as the oversize which would block the holes is out of the way. The water accompanies the fines all the way through, and this makes for better screening. So the choice would seem to depend on whether the operator was more interested in getting a clean coarse product or doing better screening all through the series.

Retain the Water as Long as Possible

It seems to be preferred practice to leave the water with the material as long as possible, in washing plants, and this is probably one reason why the first system mentioned is not more in use. Another thing against it is that it makes a very long screen which is hard to support. But it has certain decided advantages of its own. It takes the least headroom of all systems, the first cost is low, it makes a simple and compact plant and it is easy to repair. In plants where the tonnage to be screened is not too large, and where the cost of building must be kept down, it is about as good as any type that can be chosen, and it is doing good work in many plants of this kind.

The second system—that of a screen with double or triple jackets—is the most compact arrangement of all, and is an excellent screening device, taking off the coarse size first and carrying the water through all the screens. But its compact form is a fault as well as a virtue, as it makes the inside jackets inaccessible and repairs are somewhat troublesome. It is, however, an invaluable form for situations in which both space and headroom have to be saved.

The third and fourth systems are opposites, and the choice between them would seem to depend on what was wanted in the

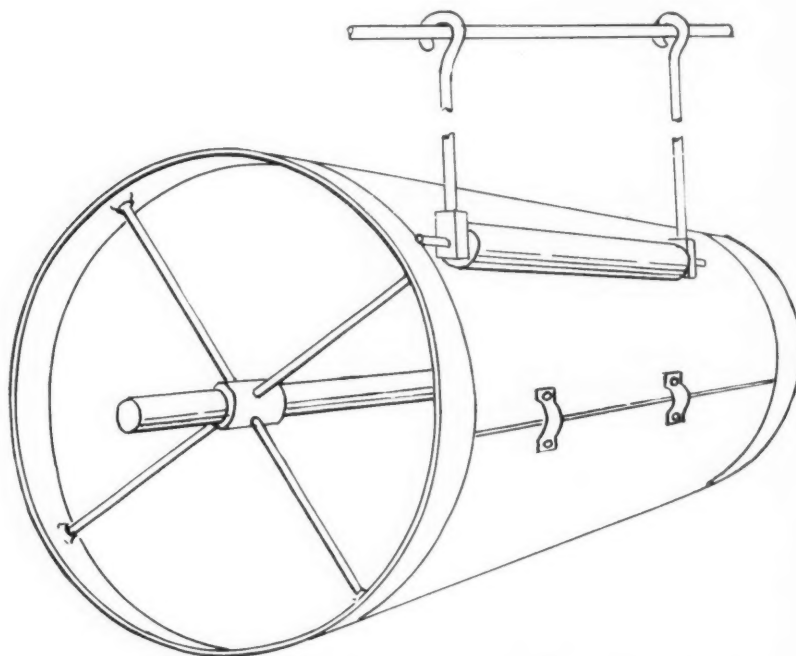


Fig. 10—Roller in swinging bearings to prevent blinding of screen

such results as this, as no two plants seem to get quite the same results with the same kind of screen fabric.

Woven-Wire Screening

It is the general rule to use woven-wire screening for the meshes finer than $\frac{1}{4}$ in., and for coarser meshes if the duty is not too heavy, so that the matter of wear is important. This would seem to be good practice, because with woven-wire screens the largest percentage of opening is available, and this counts strongly in fine mesh screening. Ton-Cap and similar screens have given the best result where there were not too many thin pieces of oversize.

Feeding the Revolving Screen

The usual way to feed a revolving screen is to put the feed inside at one end. The feed then passes to the other end, where the oversize is discharged, the undersize going through the screen and being caught in a

launder or trough below the screen. But not all screens are fed this way. The outside-fed trommel, the King screen, and the belt screens put the feed on the outside of the screen and take off the undersize by a

Necessity for Screens in Series

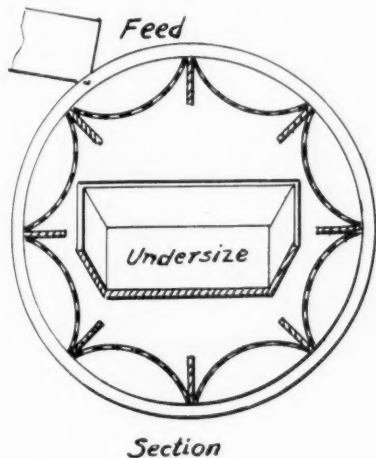
In almost all washing plants it is necessary to have a series of screens, as the market today demands a number of sized products, or certain mixtures of sizes. There are several systems by which screens are worked in series, each having its own good points, which might cause it to be chosen to meet certain conditions. These systems are:

1. The long, cylindrical screen divided into sections. The finest size is screened out by the first of the sections, and so on up to the coarsest size which is taken off over the end of the screen. This is shown in Fig. 11, No. 1.

2. The cylindrical or conical screen which has several jackets, one outside the other. The oversize discharge of all these jackets is taken off at the ends, the coarsest product

way of products. The fourth system, a series of separate screens taking out the coarse size first, is in use in by far the greater number of plants, and it is the writer's observation that the variation of this system, Fig. 4, No. 7, is used more than any other. There must be a good reason for such a preference, and this reason is probably to be found in the simplicity of the arrangement. There is only one central shaft for all of the screens, and there is plenty of room between the screens to place the bearings where they will be out of the way of the splash and dirt. The

take the feed in another than the usual way, the first to be mentioned is a standard form in wide use and sold by different machinery houses. This is the closed-end screen. The advantage claimed for it is that it is a better washing device than a screen of the ordinary type. The inside launder delivers the feed to the end, where it has to stop, turn around, and flow the other way, and this gives the grains a chance to be turned over and over in the water, giving them a thorough washing. It is made as a double-jacketed screen as well as a single screen.



feed comes on to the screen at the large end, where there is the greatest screen area, and repairs are easily made, as any screen can be taken off the shaft without disturbing the others. The one grave fault of this system is that it requires a great deal of headroom, and this is serious where large quantities of material have to be elevated.

The Conical Screen

The conical screen was invented a long time ago, and it is evident that the man who got it up did so because he wanted to avoid the use of a shaft out of level, such as is necessary with a cylindrical screen. Taking care of the thrust on a sloping shaft was troublesome to the mechanics of those days when there were no machinery dealers and supply houses, and the machines had to be built by hand. But its use in series on a steeply inclined shaft was probably evident at an early date, for it is given as a standard arrangement of screens in books published many years ago.

Regarding the method of running screens in series, the "compromise" method, Fig. 11, No. 5, about all that can be said for it is that it saves a little headroom. It is given as a standard arrangement in some of the books, but it seems never to have come into general use; it is only mentioned here for the sake of completeness.

Closed-End Conical Screen

As to the types of revolving screens that

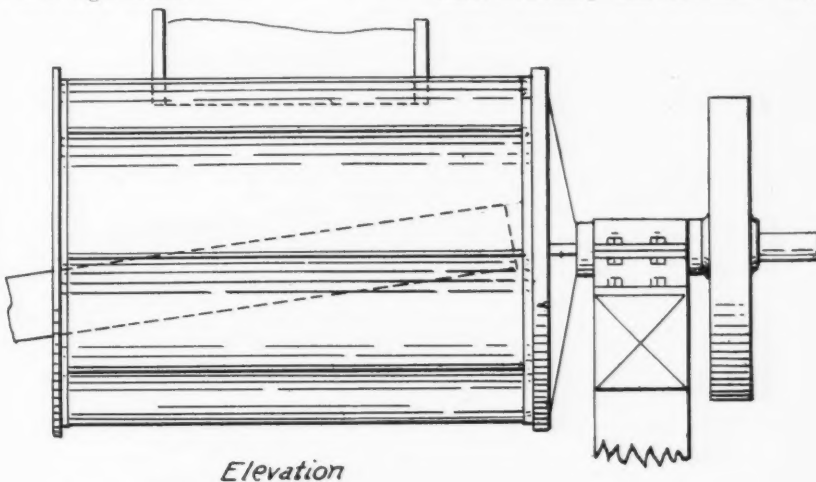


Fig. 13—Showing the King screen

The Bunker Hill screen is something like this type, with a very short and wide-angle conical shape. The shaft is set at a steep angle. It has had considerable use as a fine screen in the metal mining field.

The outside-fed trommel, Fig. 12, does not seem to be known in the sand and gravel and similar industries, but it has had a great popularity in the zinc-mining districts around Joplin, Mo., where it drove the

coarse mesh screening it is probable that the feed would not spread out so well. As with the outside-fed trommel, there is very little trouble from blinding.

The belt type of screens, Fig. 14, is much like the outside fed screens in their action, and they have done astonishingly good work in very fine screening. They are better adapted to working in series than the other types just mentioned.

Recently the writer saw a novelty in belt screens, the belt being made of woven wire in coils, the same as the old woven-wire mattress. The superintendent in charge of the plant gave it a good recommendation, saying that it was quite free from blinding and that it had a long life in service. This particular screen was of No. 10 mesh, and it was on its second year of service.

All these forms, which were of especial use in fine screening, seem somewhat out of date today, since the electrical vibrating screens came into use. But as washing plants are still erected in places where electric current cannot be had without going to great expense, there are places where they can still be used, so it is just as well to know something about them.

Summary

To sum up what has been said of revolving screens, we may say that:

1. The revolving screen (of the ordinary

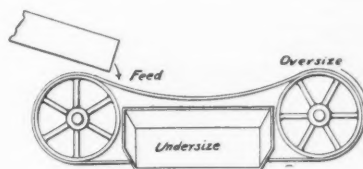


Fig. 14—The belt screen

ordinary sort of screen out of use. In that field the screening fabric is of punched plate with 2-mm. holes, but there is no reason why it should not work well with holes of a larger size. One fault is that it is not well adapted to running in a series of screens, but it has other qualities that make it worth consideration, the principal one being that it is comparatively free from blinding. There is no centrifugal force to wedge the grains into the meshes, and the angle at which the feed flows over the screen is such that there is not much tendency to blind.

conical and cylindrical forms) is especially adapted to washing plants, as it is not only a good screen but a good washer and scrubber as well.

2. For large screens with heavy duties the trunnion type of cylindrical screen is the best. The screen with a central shaft and spiders is preferred for lighter screens with ordinary duties.

3. The slope of a screen is important, and a common error is to set them with too little slope. The right speed is equally important, and poor work can sometimes be

bettered by increasing or decreasing the speed of the screen.

4. Blinding is the chief cause of poor screening with revolving screens. It may take some trouble to find out the best way to run the screens and the best fabric to use to prevent blinding, but the trouble is well worth taking.

5. Every system of running screens in series has its own peculiar advantages and disadvantages, and these ought to be studied and understood before any one of them is decided upon.

(To be continued)

British Lime Manufacturers Wage Advertising War

OLD Buxton lime has held the field for so long that the advent of a serious competitor entailed extensive propaganda. Now that Callow rock lime is making progress we are in the midst of antagonistic advertising by the rival producers on ingenious and even ingenuous lines that remind one of the salesman's comparison between lubricating oils having spherical and triangular molecules respectively. Both firms claim greater chemical reactivity for their product, the Callow interests basing their statements partly on scientific control of the burning operation and on fineness and purity, while the Buxton firms rely largely on reputation and some indefinable "natural properties" possessed by their raw material.

Good chemical lime is of considerable importance in the manufacture of bleach and for the alkali, paper, textile, ammonia and other industries, and the booklet issued by the Callow company is instructive in spite of its quite natural bias. Reactivity is presumed to be measured by the rate of reaction with water, and both firms claim that a ton of their lime will go further than a ton of "any other lime."

The lesson to be drawn seems that just as for feldspar, standard tests and specifications are needed and also the publication of comparative test results under reliable expert supervision for each particular application in the chemical industry. The fact is that competition has made the producer realize that lime is really a chemical and cannot be placed in the same category as common brick.—*London (England) Correspondence of Chemical and Metallurgical Engineering.*

The Good Roads Congress

WITH an organization that promises to be 100 per cent effective in perfecting arrangements now under way, the thirteenth American Good Roads Congress and fourteenth National Good Road Show to be

held in Chicago, January 15 to 19, will by far eclipse in program and attendance any good roads meeting in the world, it is believed.

Both events will be held under the auspices of the American Road Builders' Association. The road builders will hold their twentieth annual convention in Chicago during the congress. Many prominent speakers will attend, including high officials of the

THE QUARRY OPERATOR'S OPPORTUNITY

THREE days filled with practical information-giving talks and discussions have been planned for the quarry and crushing plant operators who attend the National Crushed Stone Association convention in Chicago, January 15, 16, and 17. No progressive owner, manager, or superintendent can attend the convention and measure its educational value without realizing that the convention has been worth to him many times the amount it costs him to attend. Financial, operating, accounting, sales, and transportation problems will be broadly and at the same time specifically covered, and there will be unlimited opportunity to swap experiences with men who have overcome the same difficulties that trouble you.

government, several governors, hundreds of state highway officials and mayors of American and Canadian cities as well as thousands of engineers, contractors and good roads enthusiasts.

Shortly after his election, Thomas J. Wasser, New Jersey highway engineer, president of the American Road Builders' Association for 1922-1923, appointed to the executive

committee the following: Charles M. Upham, state highway engineer for North Carolina; James H. MacDonald, consulting highway engineer, New Haven, Conn., and J. H. Cranford of the Cranford Paving Co., Washington.

This committee, acting for the American Road Builders' Association, appointed Messrs. Upham and MacDonald, and the Highway Industries Exhibitors' Association designated its president, S. F. Beatty, vice-president of the Austin-Western Road Machinery Co., Chicago, to act as a committee having general charge of the arrangements for both show and congress.

Bigger Production, Lower Stocks of Portland Cement

PRODUCTION and shipments of portland cement for the month of October again showed an increase over the previous month, while stocks of finished cement at factories showed a continuation of the decrease of the past six months. Statistics of the United States Geological Survey prepared under the direction of G. F. Loughlin show the October production to be 12,287,000 bbl., compared with 10,506,000 bbl. in October of 1921, and 11,424,000 bbl. in September, 1922. The October figure of this year is the largest ever reached.

Total production for 1922 from January 1 to October 31 is 93,250,000 bbl. which is only 5,000,000 bbl. below the total production of 1921. Stocks on hand at producing plants at the end of October dropped to 4,157,000, which is the lowest for more than two years.

Decorative Marble Quarries Opened in Colorado

QUARRIES of decorative marble are being opened by the Colorado Decorative Marble Co., Villa Grove, Colo. This marble is composed of beautiful reds, yellows, blacks, blue, pea-greens and many other color combinations. It is said that none of the imported colored marbles surpasses it in richness of coloring, especially in the black and gold.

The company has installed its crushing plant and is ready to ship crushed marble for terrazzo and stucco. The production of big blocks will begin in the spring of 1923.

Western States Plant to Reopen Next Spring

THE big two million dollar plant of the Western States Portland Cement Co. at Nutting Station, east of Bettendorf, near Davenport, Iowa, will be reopened next spring, according to a formal statement made by A. W. Shulthis, president of the corporation.

Why Not an American "Quarry Institute" or Association?

Not a trade association, but a fraternal and educational body, is the British Institution of Quarry Managers. In the following account a similar association for America is suggested. "Some of us would be delighted to attend your first conference," says Mr. McPherson

AT THIS particular time, when the national convention of the crushed-stone quarry industry is only two months off, and when schemes of building up the National Crushed Stone Association are foremost in the minds of many American quarrymen, the following outline of the character, aims and purposes of the Institution of Quarry Managers of

still numerous small associations of quarry owners, some so small that you could count their members on the fingers of your two hands.

The Quarry Industry One Brotherhood

Even the Federation of Quarry Owners is divided under the different classes of quarrying and subdivided into districts.

spent three days at the conference. They represented most of the largest firms of quarry owners in the country.

Naturally, as the quarries being visited were roadstone quarries, few of the slate quarry people were present but, in a small place like the United Kingdom, to bring together 100 quarry officials for three days is something to be proud of, and it is



The British Institution of Quarry Managers assembled in annual conference at Leicester, England. A group at the Mountsorrel quarry

Great Britain, written by S. McPherson, honorary general secretary, especially for *Rock Products*, is of interest:

Great Britain seems to be the home of old-established institutions. To give a list of them here would be a waste of paper, as almost every profession and industry has its own. Some have parent institutes with local or divisional branches; others have one body only. The quarrying industry had a diversity of small associations before the war, and, with the exception of the Federation of Quarry Owners—an association brought into being by the government to deal with the industry during the times when things were rather difficult to handle—there are

But all these associations and the federation are dealing with the industrial side of the business. On the other hand, the Institution of Quarry Managers deals with the educational and fraternal aspect, and has brought all the different sections of the industry into one brotherhood—granite, limestone, sandstone, basalt (trap rock) slate, silica, etc. Its progress has been most rapid and successful.

This year it held its annual conference at Leicester, the county which produces the largest quantity of granite roadstone in the United Kingdom, and visited some of the larger quarries there. One hundred members from England, Scotland, Ireland, Wales, and the Channel Islands

practically certain that this number will be doubled next year when the conference is being held in North Wales, the center of the great slate quarrying industry. At the conference in 1920 there were only 29 present.

Aims of the Institution

The aim of the institution is "An institution for the promotion of friendly intercourse between quarry managers, and the discussion of technical, geological and other matters relating to quarrying."

A little over four years ago half a dozen quarry managers met and the trend of their conversation was this: Every profession in the country has an institute.

If you are a civil engineer, a sanitary engineer, a municipal engineer, even an auctioneer, because you belong to an institution and can write a few letters of the alphabet after your name, you are a member of a profession. But because we are quarry managers, although some of us may be earning as large a salary as the Prime Minister and would not recognize some of the members of the so-called professions equal to our chauffeurs, we have no profession. We are only common quarry bosses.

Can quarry management be classed as a profession? The reply these half dozen quarry managers gave to their own question was, "Decidedly, yes!" And they set about to form the Institution of Quarry Managers.

It was a thankless and heart-breaking job at first, but they were fortunate in having among themselves and the first few members enrolled some men who did not understand the word "defeat." Twelve months' work brought them about three dozen members. They held meetings which were not attended. They read papers on interesting and educative subjects before audiences composed of half a dozen enthusiastic members and one or two friends who came to oblige them but knew no more of what the papers meant than if they had been written in Greek.

At their first annual meeting, after much labor and postage stamps, they got about a dozen together. It was at this meeting that the honorary secretary told them they'd have to publish an institution journal for propaganda purposes. Their membership was 40. The yearly subscription was one guinea (\$5), and he suggested starting a monthly news journal which would invoice a liability of a few hundred pounds a year at least. A typed circular was suggested, but the idea was turned down and the secretary ultimately got them to agree, although they all expected to be run in for a fairly large sum to liquidate the costs at the end of the year.

However, the secretary proved right. The membership began to increase; the journal proved a success and readily appealed to quarry owners and managers, and a year ago it had to be greatly increased in size.

In a little over four years the membership has increased from 14 to 400, and now employs a full-time secretary and staff. This has been accomplished without outside support, the reason of the institution's success being the enthusiasm of its members.

The country is divided now into branches, and meetings at which appropriate papers are read are held at each branch. Members who can, try to attend meetings in different parts of the country

outside their own district occasionally. For example, September last, a dozen members crossed the English Channel and spent a week-end with the Channel Islands branch. In November, many are going from England and Wales to the first meeting to be held in Scotland to give it a good send-off.

If this is not masonic fellowship, I'd like to know what is.

Several American Members

Dr. Oliver Bowles, of your Bureau of Mines, is a member. A couple of your

WE HAVE not fully appraised the value of publicity. Its practical results and its necessities in all departments of economic life without discrimination or exception have not been given due consideration.

The full exposure to the people of business methods and management on the part of public and private institutions and organizations will create and firmly establish a powerful, effective and satisfactory public sentiment which, on the average and for the long run, will be more potential than penal statutes.—Elbert H. Gary.

slate-quarry managers up in Pennsylvania are on the roll; we have members in Canada, Spain, India, Egypt, Norway and South Africa.

Now I want to get the United States quarry owners and superintendents interested and should be greatly obliged if some of them would write in to me and offer their assistance. "Unity Is Strength." Why, some of us would be delighted to cross the herring-pond to attend the first conference of the Institution of Quarry Managers of America. Our institution is entirely different from all trade associations; it is purely fraternal and educational.

Don't you think that quarry management is a profession?

Don't you think it advisable to raise the status of the quarry manager to that of other professions?

Don't you agree that by helping one another we can help ourselves?

Then that is what our institution aims at.

Good Prospects for Phosphate Rock

DEVELOPMENT of the potential hydroelectric power of the Duck river, which runs through the northern portion of the phosphate rock fields of middle Tennessee, or the Buffalo, which runs a few miles to

the west of the deposits, says *Chemical and Metallurgical Engineering*, has been suggested by men in the phosphate rock business in that section. It is thought that the greatest need of these fields at the present time is cheap hydroelectric power. It had been hoped by these interests that the work at Muscle Shoals would be rushed to such an extent that they could get power from that source. They are now looking around, however, for another source for this power.

The phosphate rock mining, crushing and washing in this section have grown to large proportions during the past two years, in spite of the small comparative sale of fertilizer during that period. At present 600,000 tons per year are mined and employment is given to 2000 men.

Most of the rock being mined at present is being shipped to the Northwest for the wheat crops. As soon as these shipments are completed the rock will be diverted to the plants of the various fertilizer companies in the South.

It is predicted that fertilizer sales will take a big lead over those of the past two or three years. This is accredited to the fact that very little fertilizer has been used in the past two or three years by the Southern cotton farmer, and with the demand for cotton being ahead of this year's crop, the farmers will be encouraged to try to produce larger crops next year.

Recent announcement has been made that the American Agricultural Chemical Co. will erect a large crushing and washing plant in connection with a large tract of proved, high-content rock which it holds near Cleburne, Tenn. Work on this plant is progressing and it is thought that it will be started in time to produce rock for next spring's fertilizer business.

An 18-ft. Chinese Highway Costs \$207 a Mile

THE general width of the highways in the Province of Anhwei, China, says *Commerce Reports*, is 18 ft., although this varies slightly, according to local conditions in the sections traversed. Where the width of the right-of-way permitted wheelbarrow paths 3 ft. wide were left on either side. The Chinese wheelbarrow is used for long-distance transportation of goods. It has a very narrow tire and is invariably heavily loaded, and therefore is one of the worst enemies of good roads. The cost of construction per mile has been approximately \$207 American currency. The only appreciable element of cost was the money paid for labor.

The good-roads movement in China received a decided impetus from the expenditure of famine-relief funds in work of this nature, which undoubtedly greatly improves the economic condition of the district concerned and provides a limited market for American road-building machinery and supplies, and later for automotive equipment.

British Quarry Practice

By W. Shaw,* Hillhouse Quarries

No. 2—Mr. Shaw continues his most interesting account of quarry practice across the water. This final installment treats of operating costs and how they can be reduced; what little has been done with labor-saving tools, and awards praise for American machinery

OUR first difficulty was that the shovel lifted stone much too large for our 30x16-in. crushers. We struggled along for a time, but it soon became evident that a large primary crusher was absolutely necessary if the shovel was to be continued.

I had seen the largest crusher used in this country up to that time, and I did not like it—in any case it was too small for our purpose. I had read of enormous crushers working in American quarries, but as usual I did not believe that such machines could be built in sections which would stand up to really tough rock. I had to travel 7000 miles to be convinced that I was wrong again, and this I thought at the time was adding insult to injury. As luck would have it, the first quarry I wandered into had one of the largest crushers in use in America, the jaw dimensions being 8 ft. x 7 ft. I can quite distinctly recall the shock I received when I saw it.

After seeing the large shovels, each capable of picking up 1,500 tons of stone per day, I left that quarry feeling very humble and prepared to believe anything.

The methods of haulage in the American quarries vary according to the position of the quarry. In most cases train loads of wagons of about six tons capacity were hauled to the crushers by locomotives.

Laying out a quarry for steam shovel work is quite a different proposition from loading by hand. The railways should be arranged with the necessary gradients to allow a wagon to move away whenever it is loaded, and to be replaced by an empty wagon. There is a great loss in the efficiency of steam shovels everywhere through lack of proper arrangements to keep them supplied with empty wagons. I have seen very bad cases in this country, but it is also a common complaint in American quarries.

In some of the larger quarries the Woodford centrally controlled electrical system has been adopted, and is, I understand, giving complete satisfaction. It would take up too much time to discuss this system in detail, but briefly, it means that one man sitting in a tower can control the haulage of

from 4000 to 6000 tons per 10 hours from quarry to crushers.

You can judge for yourselves what this means in the operating costs if you consider at the same time their methods of blasting as already described. It will be sufficient to note that when stone was selling in this country at 12s. to 15s. per ton, the same material in America was 3s. 9d!

In many quarries in this country the stone is loaded direct from crushers or screens into trucks. Storage bins for broken stone, except when transport is by water, are not very common, yet I consider them absolutely essential for the successful working of any quarry producing broken stone.

Must Prevent Stoppages

Working is a habit, as I suppose you all know from your own personal feelings about it. At least, I have never met a man who commenced to work because he liked it. One of the most interesting experiments I can remember was breaking in some men who had never worked two consecutive days in their lives. It took quite a long time before they acquired the habit of working steadily.

I have also watched the no less interesting experiment of men unconsciously increasing their output by 100 per cent. This was done by simply providing means whereby they acquired the habit of working steadily—all day and every day.

I have already explained what is necessary in a quarry to secure this, but no system will avail unless provision is made to prevent stoppages through temporary shortage of trucks, steamers or orders. Do not ask me what storage is necessary to prevent stoppages. That depends entirely on local conditions, but I have never seen or heard of a quarry which had too much. The storage must, however, be such that when the trucks, steamers or orders do come in, not one man will be displaced to deal with them.

In some quarries in this country, and also in America, the stone is piled up on the ground and has to be rehandled by either men or grabs. The first entails either keeping a squad of men killing time at other jobs, or stopping the quarry when the stone has to be loaded. The second demands expensive machinery and a few spe-

cial men. Compare the cost of either with proper arranged bins and sidings which will enable one man and one boy to load 1000 tons in 10 hours.

The ordinary hopper door commonly used in this country is a source of great trouble and expense when loading such a mixed size of material as fluxing stones. How often have we seen a loader wrestling with a door which would not close, with the result that trucks were either over or under loaded, and had to be adjusted by labor. A properly designed hopper for fluxing stone should have no door. The storage bins should have flat floors with the trucks or conveyors running underneath. On no consideration should the floors be on an incline and the loading done from the front.

To load into steamers, conveyors are necessary if the full capacity of the bins is to be utilized. There are, as you all know, various kinds of conveyors. The only ones with which I have any experience are the steel tray and the belt variety.

I am interested in a fluxing quarry where several of the former are used, and the only good thing I can say about them is that the manager can be taking his dinner in his house, a mile away, and yet know at once if they stop working. I may add that they were there before I saw the quarry. I suppose the reason for their existence was the commonly accepted idea that a plain belt would not carry stone unless when running practically level.

Two years ago I put down one to carry 100 tons of 8-in. stone per hour, at an angle of 15 deg. Last year I put down another with a 20-deg. grade to load steamers at the rate of 300 tons per hour. Both are doing their work without the slightest hitch, and the manager has to be on the job to see whether they are running.

Done Practically Nothing in Labor-Saving Tools

These remarks are, no doubt, rather disjointed, but I think you will have gathered that in my opinion the quarrying industry in this country has not made the progress it should have done.

The labor-saving tools, which in most cases are confined to crushers and drills, are too small, and we have done practically nothing to extend the practice in this di-

*Mr. Shaw's paper was read before the Institution of Quarry Managers, North of England District, at Darlington recently. The first part of the paper appeared in the November 4 issue of Rock Products.

rection. The majority of our quarries have been commenced and the plants laid down without due provision for future extensions. The result is that when additional plant has had to be installed it could not usually be arranged in proper relation to that already working, or it was squeezed into corners where effective supervision and repair was not possible.

This is asking for trouble, because, unless access to all parts of a machine is easy, that machine will not receive proper attention, and the first notice is usually in the form of a breakdown.

Americans say that this is the result of our lack of imagination; in their picturesque language they term the class of plant most common on this side 'crow nests.'

The manufacturers of crushing and other quarrying plants in this country are not free from blame for this state of affairs. Their aim, I feel sure, is to give satisfaction, but it often appears as if they purposely designed their plants to ensure the maximum wear and tear and consequent renewals. If the makers had to run the plants after they are in commission, they would be more careful and would certainly see that access was available to every part.

I shall conclude this paper by giving a short account of what has been done in the quarry with which I am directly connected in the way of using larger tools.

We purchased a No. 20 Ruston navy in 1918. This machine has given every satisfaction up to date; it has loaded at least 350,000 tons of basalt. The tear and wear is very severe in handling such hard and tough rock, but there would be nothing like the same up-keep necessary when handling limestone.

Two men work the machine, one at the controls, and the other firing and oiling, while two men prepare the road for moving forward. The railway along the face of the quarry is laid with just a sufficient decline to allow the loaded wagons, which have a capacity of six tons, to move away when the brake is released. As the railway is laid to approximately form the arc of a circle, there is always an empty wagon behind ready to move into place. Our record with this navy is 780 tons of stone loaded in 10 hours. The wagons run by gravitation from one end of the face to the other, a distance of about 800 ft.; from the lowest point they are hauled up an incline by a 100-hp. electric haulage to the primary crusher, weighed, emptied and passed on to complete the cycle.

American Machinery Not "Shoddy"

The primary crusher is 54x42-in. in size, supplied by the C. G. Buchanan Co., New York. I purchased this crusher after inspecting several different types actually at work in the New England trap-rock quarries. It commenced work in September, 1920, and has since that date crushed about 180,000 tons of stone.

I had always the opinion that American

machinery in general was shoddy and built for a short life, but this crusher has been a revelation to all who have seen it at work. We have never had any suggestion of a heated bearing, and today, after smashing six-ton loads into the jaws for nearly two years, it is running as silently as a Rolls-Royce car. The actual horsepower required to run it empty is 110; when the jaws are fully loaded—and they hold six tons—only 10 hp. extra is required. That fact in itself is quite sufficient to prove that this machine is of a different type to those to which we are accustomed.

The stone, after passing through the primary crusher, falls on to a 30-in. belt conveyor which carries it to two 30x16-in. Broadbent crushers. The final breaking is done by five 21x10-in. crushers and one set of 24x24-in. rolls. The material is then separated into eight different sizes, the largest being 2½ ins. Each size falls from the screens on 18-in. belt conveyors, which carry it to the storage bins.

The number of men actually employed from, and including drilling, till the stone is loaded into railway trucks, does not exceed 20. There are, of course, other men engaged making tar macadam, baring, etc. About half our output is despatched in the

form of tar macadam. The dust created in crushing the stone is collected and sold for various purposes. In connection with this latter subject, I shall give you a final example of the indifference which has landed the industry into its present state.

Many years ago I visited very large limestone quarries in England the output of which was being used for roadmaking purposes as well as fluxing, consequently there was a good deal of crushing and the dust created was a great nuisance.

I could not resist telling those responsible about the plant we had put down to deal with dust, the makers of it, its cost, the value of the dust and the markets for it. I learned several years afterward that nothing had been done, and that the dust was still free to blow all over the place, ruining belts and bearings and making men's lives miserable. The actual value of the dust lost in this concern would not be less than £3,000 per annum. The only expense necessary to recover this money would have in truth landed the industry into its present state.

I should have preferred to end my paper with something pleasant, but unless someone uses the knife to bare the sores there can be no hope of a cure.

Recent I. C. C. Decisions

EXAMINER John A. McQuillan has recommended reparation in No. 13391, Meridian Fertilizer Factory vs. Mobile & Ohio et al., on a finding that the applicable joint commodity rate of \$6.70 per net ton on 51 carloads of crushed phosphate rock from Mobile, Ala., to Shreveport, La., shipped in September, 1920, was unreasonable to the extent that it exceeded \$4.94. The complainant sought reparation to the basis of the rate of \$4.94. When the shipments moved there were in effect joint rates of \$4.935 over the routes of the Mississippi Central to Natchez and the Louisiana & Alabama beyond; and the Mobile & Ohio to Meridian, the Alabama & Vicksburg to Vicksburg and the Vicksburg, Shreveport & Pacific beyond. This rate became \$4.94 on December 10, 1920.

Examiner E. L. Gaddess has recommended an award of reparation in No. 13579, Thomas R. Heyward Company vs. Director General, on a finding that rates charged on 20 carloads of fluorspar from Salvisa, Ky., to Watertown, Mass., South Bethlehem and Reading, Pa., Sparrows Point, Md., and Rahway, N. J., were unreasonable and unduly prejudicial. The charges assailed were unreasonable and unduly prejudicial to the extent that they exceeded the charges that would have accrued at a rate of 3 cents per 100 lb. over the rates contemporaneously in ef-

fect from Danville and Junction City, Ky.

Examiner J. Edgar Smith, in a tentative report on No. 13642, International Pulp Co. vs. Director General, as agent, has recommended that the Commission find that a rate of 40 cents per gross ton on crude lump tale from Taleville, N. Y., to Hailesboro, N. Y., during the period June 25, 1918, to July 12, 1919, inclusive, was not unjust or unreasonable, but that a charge of \$15 per car on the same commodity from York Siding, N. Y., to Hailesboro, N. Y., during the same period, was unjust and unreasonable to the extent that it exceeded 1.5 cents per 100 lb., and that reparation should be made to that basis.

Chicago's Sand and Gravel Demand Exceeds Supply

THE demand for sand and gravel was in excess of the available supply in the Chicago market on November 9, due to the inability of shippers to get cars for loading at the producing points.

Dealers in the outlying sections reported stocks exceptionally low with inquiries and orders still numerous for immediate delivery to contractors. Building, while not so active as this time last month, still is going ahead and there was a steady demand for lime, cement, and other staple items, with the prices for all items holding firm and steady.

Feldspar Mining and Milling in New Hampshire

By Raymond B. Ladoo

Mineral Technologist, United States Bureau of Mines

This state shows a rapid rise in feldspar production; the ore has unusual purity and size, and a large tonnage seems reasonably assured, according to the Bureau of Mines, which has recently investigated this deposit

ONE of the important recent developments in the feldspar industry has been the rapid rise of New Hampshire as a feldspar producing state. The unusual size and purity of the deposit now being worked near Keene, and the improved methods of mining and milling used, have been responsible for this situation.

Feldspar was occasionally produced some years ago in small quantities in New Hampshire, but the state had not been considered a producer of feldspar until 1921. In the spring of that year, the Keene Mica Products Co., of Keene, began in a small way the production of feldspar from its property in Gilsun, which had long been operated as a mica mine. The purity of the feldspar at once attracted favorable attention, and the production of crude ore rapidly increased. Early in 1922, a new company, the Golding-Keene Co., was formed, to grind the feldspar and the construction of a mill at Keene was begun. In June, 1922, the first unit of the mill was completed, and in a few days grinding on a commercial basis was started. The mill embodied the suggestions given in a recent report on the feldspar industry* by the Bureau of Mines, and so far the operation of the mill has been entirely satisfactory.

Keene's Deposit of Feldspar

The feldspar deposit is located in Cheshire county in the southern edge of the town of Alstead just across the line from Gilsun, about 11½ miles by road north of the mill at Keene. The road for the first eight or nine miles out of Keene is macadam, but the rest of the distance is good country road.

The ore body stands nearly vertical between walls of mica schist. Between the feldspar body and the schist walls on each side occurs the mica for which the deposit was opened. The width of the peg-

matite dike varies from 40 to about 200 ft. The total depth has not been proved, but mica workings to a depth of more than 200 ft. showed no apparent change in the nature of the deposit. Mica workings have also been extended over a length of



A feldspar quarry near Keene, N. H., the view being taken from the top, looking down

750 to 1000 ft. along the vein, with no change in the deposit indicated. Thus a large tonnage of ore seems reasonably assured.

The feldspar is pure white and shows little or no evidence of alteration. It occurs in large crystals and masses together with relatively small quantities of coarsely crystallized quartz. There is

little or no graphic granite or intergrowth of feldspar and quartz. The problem of making pure or No. 1 grade spar by selective mining and sorting is thus comparatively simple.

In the openings exposed at the time of examination in 1921, and again in 1922, the quantity of pure feldspar in the total vein seemed to be from 75 to 85 per cent. Present mining recoveries do not reach these figures on account of losses in the fines, but when new equipment is installed these percentages of recovery should be approximated.

Aside from the small quartz content aforementioned, there are few impurities. Finely granular muscovite mica occasionally occurs, but it can be sorted out easily. Near the walls the feldspar is usually less pure, and sometimes contains a little biotite, rarely garnet, tourmaline, and beryl. This wall rock is commonly left standing in the quarry. No biotite, tourmaline, garnet, or beryl was noted in the mineable rock. The quality of the feldspar with respect to injurious impurities is unusually good.

Analyses of both the No. 1 and No. 2 grades of spar, as given by the Golding-Keene Co., are:

	"Puritan" or No. 1 Grade —Per Cent	"Keene" or No. 2 Grade —Per Cent
Silica (SiO ₂).....	66.45	69.59*
Alumina (Al ₂ O ₃).....	19.45	16.99
Iron Oxide (Fe ₂ O ₃).....	0.07	0.09
Lime (CaO).....	0.11	0.65
Magnesia (MgO).....	0.27	0.27
Potash (K ₂ O).....	11.04	10.20
Soda (Na ₂ O).....	2.75	1.68
Ignition Loss (H ₂ O).....	0.15	0.70
Total	100.02	100.17

*Corresponds to about 17 per cent free quartz.

From the examinations of the deposit and from analyses received it seems that the grade and quality of the feldspar in different parts of the quarry are approximately uniform.

The Method of Mining

The method of mining in use at the time of the last examination (June, 1922) was but a makeshift adopted at the open-

*Ladoo, R. B., "Conditions in the Feldspar Industry," Bureau of Mines Reports of Investigations, Serial No. 2311, January, 1922.

ing of the deposit in order to obtain quickly a large production. The installation of new machinery and equipment was under way and new methods of mining and handling the ore are soon to be adopted. At present, the feldspar is obtained from a rectangular pit about 65 ft. square and 100 ft. deep. The ore is

going down along the strike, at a dip of about 30 deg., to a depth of 200 ft. vertically. At the 100 and 200-ft. levels, drifts will be driven from the shaft along the vein. Then beginning at the shaft the feldspar will be drilled and shot down in benches, and the mine-run rock hoisted in cars. The cars will be trammed around

be distributed over large loading bins which have a total capacity of about 275 tons. Separate bins are provided for No. 1 and No. 2 grades.

It is further contemplated to open one section of the deposit as an underground mine, which can be worked in bad weather, especially in the winter, in order to avoid interruptions to steady production.

The equipment in use at present and that on the ground ready for installation includes a 250-b.hp. boiler; a large duplex two-stage air compressor; a drill-sharpening shop with a mechanically operated drill sharpener; and an oil-fired forge. Besides this equipment, numerous derricks, hoists, air drills, and pumps are used in the mica mining operations that are still being conducted. When the new installation is completed a production of from 200 to 250 tons per day is expected.

Hauling the Ore to the Mill

When the production of feldspar first began at Keene the ore was hauled about 11½ miles to the railroad on contract in large motor trucks holding from 10 to 12 tons. As these trucks proved destructive to the roads, the local authorities placed the maximum weight of truck and



This is another quarry near Keene showing the top of the pit and the derricks

drilled with compressed-air hammer drills on columns or tripods, and is shot down in low benches. The large blocks are then broken up by sledging or shooting. The feldspar is loaded with forks into large pans, holding about one ton each, and hoisted by derricks to the surface, where it is either dumped into waiting motor trucks or into a loading bin.

Waste and the finely broken spar that passes between the fines of the forks are loaded separately into pans, hoisted and dumped; the waste is dumped on a waste pile and the partly broken spar on a special dump for future recovery. The better the grade of the feldspar, the better is its cleavage and, consequently, the greater the loss in the fines by the present system. Little real sorting is necessary and no cobbing is done. At present, a gross output of about 4½ tons per man per day is obtained, counting all the men employed in any way in the production of feldspar.

The mine is now being worked two 9½-hour shifts per day, six days a week. A net output of from 100 to 120 tons per day is the maximum attainable with the present openings and equipment, and this production has recently been maintained. No pumping is necessary. At night the quarry is lighted by large portable, acetylene torches equipped with reflectors.

The new methods which will soon be used were outlined by the company as follows: A new quarry will be started to the east of the present workings. An inclined shaft will be sunk in the vein



The new loading bins under construction

to a system of sorting and loading bins at the road. Here the rock will be dumped over six grizzlies or bar screens with 8-in. openings. The coarse waste will be sorted out, and the spar will be sledged until it all passes through into six bins holding four to five tons each.

From these small bins the ore will be drawn off, through gates, over slotted screens, with one 3-in. opening set at a low angle. Waste will again be sorted out from the oversize. The fines will pass into small bins and thence by cars to a fines dump for later treatment and use. The oversize clean spar will then

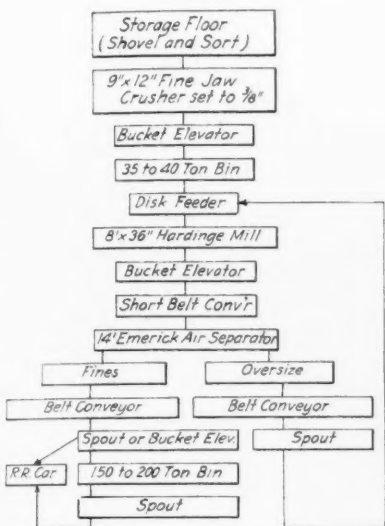
load at a figure which permits the hauling of only five to six tons of ore per load. The hauling is all done on contract, and goes on day and night. The contract price includes unloading at the mill, or loading into the railroad cars at Keene if the rock is to be shipped as crude ore.

During the winter of 1921-22 it was possible to haul by truck almost without interruption, but this record probably can not be attained every winter. At present, in order to guard against delays in haulage, it is planned to build up a stockpile at the mill. Later, it is planned to build a narrow-gauge tram road or aerial tram-

way from the mine at least to the point where the macadamized road begins.

Milling of Feldspar Ore

The present mill is not to be considered as final either as to arrangement or capacity. Since a rather new and as yet little used (for feldspar) method of milling was



Capacity: Estimated at 1½ to 2 Tons Per Hour
Power: Electricity, about 100 HP installed

Flow sheet of the Golding-Keene Co.'s feldspar mill at Keene, N. H.

to be followed, it seemed best to build but one unit at first, and not to install auxiliary equipment, such as driers, until later. This procedure would enable the determination of such factors as the size and speed of machines, the power needed, thus saving time and expense in the larger installation.

The crude ore is unloaded on the floor of the mill and is shoveled into a 9x16-in. manganese steel jaw crusher, of a special type, which in one operation will crush large lumps to about ¾-in. size. The further progress of the rock through the mill may be followed on the accompanying flow sheet.

All the wearing parts of machines that come in contact with the feldspar are of manganese steel. The Hardinge mill is lined with silex blocks and is charged with about six tons of flint pebbles ranging in sizes from 2 to 5 in. The capacity of the jaw crusher is several times the present grinding capacity.

While at the time of examination the mill had not been running long enough to be fully adjusted, yet it was clearly demonstrated that a very finely ground product could be made uniformly and a good output maintained. The product averaged from 99½ to 99¾ per cent through a 140-mesh, and from 90 to 92 per cent through a 300-mesh screen. It

was noticeable that even the small amount of oversize was very finely and uniformly ground, and nearly all would pass a 120-mesh screen. This product is in sharp contrast to the oversize resulting from grinding in batch mills, which often is relatively coarse and lacking in uniformity.

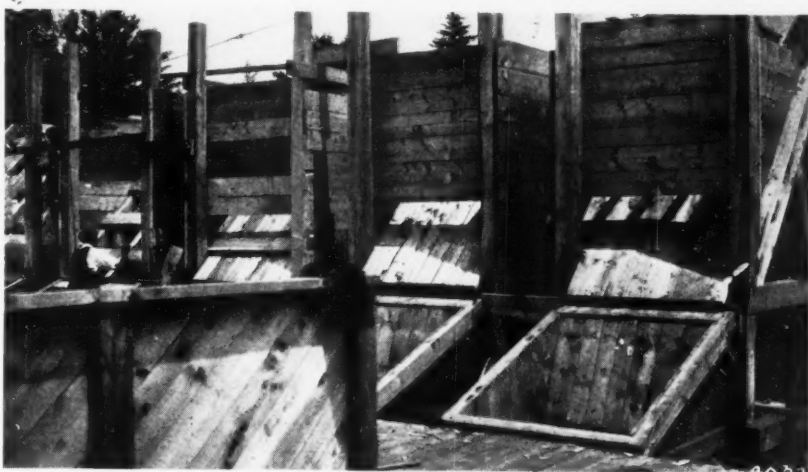
When the new mixing and sorting system is completed and in operation so that the ore is fully sorted before reaching the mill, it is planned to dump the incoming crude ore into an elevated bin in the mill building and feed the crusher by gravity from the bin. As soon as the present mill unit has been tested thoroughly and its possibilities fully developed, the company plans to install a drier, additional grinding, and air-separation equipment.

The success of this method of milling following the general methods outlined by

product and how much it can sell, in order that the business may be conducted in an economical way.

Anything that helps them determine these facts tends to make the operation of an industry more economical. The problems which constantly confront management of adjusting manufacturing to the market are much more easily solved when the human factor enters as little as may be into their considerations.

Control over the finished product as it passes through the plant must be maintained through the use of foremen and clerks. The amount of work necessary from these workers is almost directly proportional to the number of stops which the product makes, and is also influenced by the complication of the path of the product.



Showing the details of the bins

the Bureau of Mines, offers definite proof that feldspar can be ground continuously and sized by air separation, at the same time making a better product, at a lower cost, than is common in batch grinding in "dump cylinders."

Material Handling Equipment Helps Management Control the Product

BY THE elimination to a large extent of the human factor in handling the finished product, the management is enabled to determine far more accurately the amount of this product which may be handled, writes Graham L. Montgomery in *Chemical and Metallurgical Engineering*. This aids distinctly in determining the amount of the product which must be manufactured and the amount of the product which must be sold. It is obviously necessary that the management must know how much of the product to make, how much it can handle as finished

product and how much it can sell, in order that the business may be conducted in an economical way.

"The Red-Handed Anarchist of the Grain Fields"

IN co-operation with the Bureau of Plant Industry, United States Department of Agriculture, the Conference for the Prevention of Grain Dust has sent out to every farm bureau office, railway station, bank, mill, elevator, creamery and lumber yard in 13 Northern states a 41x28-in. colored poster showing the destruction caused by the common barberry.

This striking poster pictures in colors the typical barberry bush, describes it accurately, and gives its characteristics. This poster is part of the campaign against black stem rust, the world's most destructive disease of small grains. The common barberry spreads black rust to wheat and other small grains and has caused an annual loss of 50,000,000 bushels.

Fluorspar and Its Uses

The role this non-metallic mineral plays in the open-hearth furnace, and other uses to which it is put as well as its production, importations, and prices

FLUORSPAR, a comparatively unknown non-metallic mineral of moderate cost, widely distributed geologically, but of commercial value only in a few places in the world, is of essential and economic importance to steel makers from the fact that from 80 to 85 per cent of the world's production is used in basic open-hearth and electric furnaces as a flux and detergent, and there is no known substitute, states G. H. Jones, president of the Hillside Fluorspar Mines, Chicago, in an abstract published in the *Iron Age* for November 9. Its consumption runs evenly with the production of basic open-hearth steel ingots, and its production increases or decreases as the steel business is good or bad.

The demand for steel making is for a washed gravel, sized $\frac{3}{4}$ -in. and under, of 85 per cent and over in calcium fluoride and not to exceed 5 per cent in silica, and free from sulphides, lead and zinc, the shipper being penalized according to an agreed percentage, varying with different buyers, for a lower calcium fluoride or a higher silica content than the percentages here given. A properly equipped mine has its own laboratory and watches the analyses as they are made from the mill feed, mill run and car loadings, and is therefore in a position to guarantee to the user the analysis specified.

The Necessity for Specifications

I suggest the necessity for buyers to adopt standard specifications for fluorspar and that this be taken up with the American Society for Testing Materials, in order to determine what analysis is best for steel makers and other users, presenting penalties for inferior quality, and a bonus for superior ones, as in the case of iron ore.

The open-hearth melter would then know exactly what he had to work with. It is a common assumption that the melter throws in so much spar whether high or low in calcium fluoride or silica, but that is not the case as he uses only enough to bring about the reaction required, and in that way readily determines the grade employed.

Fluorspar's Role in the Open-Hearth Furnace

From the heads of the operating departments of a large steel company, I

have been given the following information:

The elimination of phosphorus and sulphur depends almost entirely upon the limestone, so in order to take care of the phosphorus and sulphur it is necessary at all times to have a highly basic fluid slag. Phosphorus is reduced at a low temperature while sulphur is reduced at a high temperature. In fact, most of the sulphur is reduced after the heat has been melted and the slag made fluid and the bath raised to higher temperature.

The limestone slag, immediately after the heat is melted, lies like a blanket upon the bath and to insure proper oxidizing conditions it is necessary to thin up the slag, and render it more fluid so that the metallic contents of the bath will come into more intimate contact with the oxidizing slag. It is the universal practice in this country to use fluorspar for this purpose. Fluorspar acts as a neutral reagent and does not affect the basicity of the slag. The increased fluidity not only allows for quicker elimination of impurities in the metal but allows the transference of heat from the fuel to the bath of metal in much quicker time.

The Practice Twenty Years Ago

Twenty years or more ago it was the general practice in most of the steel plants of this country to add fluorspar just before the furnace was ready for tapping. During later years, however, it has become the more general practice to add the fluorspar in the early stages of the working of the heat, not only to allow the slag time enough to function properly with regard to impurities in the metal, but to eliminate sulphur at higher temperature and to allow the furnaceman more opportunity to quickly raise the temperature of the bath in case it is necessary to tap the heat a little early.

In some steel making districts, particularly in the East, pig iron is apt to be high in phosphorus and low in manganese and it is the general practice where scrap is plentiful and cheap, to charge as little pig iron as possible. Iron of this character requires a high lime charge, due to the fact that the small pig iron charge with consequent decreased amount of silicon and manganese does not tend to create a fluid slag; therefore, large additions of fluorspar are necessary.

High manganese pig iron increases the fluidity of the slag and, therefore, decreases the amount of fluorspar necessary for thinning out the slag. A low silica content in fluorspar is most desirable as a high silica content means additional limestone. The latter item is not desirable from a tonnage standpoint because a high limestone charge adds to the time of heat in the furnace with the subsequent reduction of tonnage.

The general practice in this country would indicate the average consumption of from 8 to 10 lb. of fluorspar per ton of steel. This depends upon the character of pig iron, scrap, etc., used in the various districts. The use of alumina as a substitute for fluorspar is being advocated in some quarters but to date has not been proved up commercially.

No bad effects of the spar on the walls or roof of the open-hearth furnace have been known and it has been found as time goes on that open-hearth superintendents are increasing the amount of fluorspar used per ton of steel melted.

Dr. H. M. Howe in "The Metallurgy of Steel" (1890) in summing up fluorspar says it appears to favor dephosphorization:

1. By liquefying the slag and enabling it to assimilate the lime present, part of which might otherwise remain unmolten and inert and thus rendering the slag effectively basic to it.
2. Probably by volatilizing silicon from the metal, thus diminishing the formation of silica and thereby increasing the basicity of the slag.
3. In certain cases, for example, when the conditions are not strongly oxidizing, by volatilizing phosphorus as fluoride.

Dr. Richard Moldenke, at the New York Institute meeting, February 19, 1922, claimed that basic hearth electric furnaces should be used in every new installation. To desulphurize rapidly and well, lime and fluorspar must be used in combination to form an active slag on the molten metal.

The *Iron Age*, April 6, 1922, under the heading of "Fluorspar in the Open-Hearth," reviewed editorially an article from a German source previously printed in that magazine of March 23, 1922, to which I refer you.

Outside of the steel industry, many uses, and growing ones, are found for fluorspar. The glass, ceramic and enameling trades, including enameled tile and brick, are the next largest users, and use the highest grade hand picked and ground

spar. Then come perhaps the electrolytical smelting of lead and antimony and other non-ferrous and ferrous smelters. It is also commencing to regain the standing it once had among foundries, the demand from which is expected to steadily increase, as the benefits derived include the reduction of the coke necessary on account of the reduction of the number of pounds of fluxing material used.

Cleaner castings are obtained on account of more fluid metal and greater freedom from slag, and stronger castings for the same reason. Less iron is lost in the slag and the slag is more liquid. Less work is required in cleaning and repairing the cupola and taking care of the dump, by reason of the liquid slag causing the cupola to clean itself more readily, and that this class of slag is brittle and hence breaks up more readily in cleaning away the dump. Fluorspar is also the main component part of many special foundry fluxes.

Benedict Crowell, in the *Engineering and Mining Journal*, January 21, 1922, made this statement: It is not generally realized that the known fluorspar deposits of this country are very limited in extent. War stimulation failed to develop a single new ore body of consequence. The increased supply in 1917 and 1918 came from the exhaustion of reserves at the principal mines, depletion of all old and newly located shallow deposits, working over old dumps, and salvaging the low grade ore left in the old workings of abandoned mines. Prices of \$35 to \$60 per ton justified extreme activity.

Production and Prices

Production of fluorspar in the United States was first reported in 1883. Years of normal production are:

	Tons
1883	4,000
1892	12,250
1900	18,450
1905	57,385
1910	69,427
1915	136,941
1920	186,778

The largest shipments, due to previous war demands, were 263,817 tons, in 1918, to which add 12,572 tons imported in that year. In 1921 shipments dropped to 34,960 tons due to large stocks and depression in the steel business.

English production has averaged for the last eight years about 50,000 tons annually. Exact German production reports are not available, but indicate about 8000 tons annually, and should show much larger for 1921 and 1922.

The highest average prices realized for fluorspar at mines, including shipments made on old low-price contracts, were:

	Per Ton
1918	\$20.72
1919	25.49
1920	25.26

Basic open-hearth steel production at 5-yr. intervals shows:

	Tons
1900	2,545,091
1905	7,815,728
1910	15,292,329
1915	22,308,726
1920	31,375,723

As indicating the consumption of fluorspar for these years gravel fluorspar was produced in the United States as follows:

	Tons
1910	52,013
1915	114,151
1920	154,786

No records were kept of importations when fluorspar was on the free list, prior to August, 1909, but for subsequent years imports were as follows:

	Tons
1910	*42,488
1915	7,167
1920	24,612

*Largest on record.

Imports

Of the 1920 imports England furnished 17,096 tons, Canada, 7086 tons, chiefly from British Columbia, and Germany, 407 tons.

Fluorspar was on the free list until August, 1909, when a duty of \$3 per ton went into effect. This was reduced to \$1.50 per ton, October, 1913. The present duty of \$5.60 per ton is in the new tariff of September, 1922.

A rough estimate shows consumption as follows:

	Per Cent
Steel ingots and castings.....	80 to 85
Glass and enameling.....	7½ to 10
Hydrofluoric acid.....	5 to 6
Foundries.....	1 to 2
Miscellaneous.....	2

Production of Sand-Lime Brick for 1921

IT IS announced by the Department of Commerce that the census reports show considerable decrease in the activities of the establishments engaged in the manufacture of sand-lime brick during 1921 as compared with the year 1919. The total value of products reported amount to \$1.-

industry classifications. Of the 25 establishments reporting for 1921, seven were located in Michigan, two each in Florida, Indiana, Minnesota, New York and Wisconsin; and one each in Georgia, Louisiana, Massachusetts, Ohio, Pennsylvania, South Dakota, Tennessee and Texas.

The decrease in production has been accompanied by decreases in the number of persons employed, in the total amount paid during the year in salaries and wages, and in the cost of materials used.

There was considerable fluctuation in the monthly employment of wage earners in 1921. In October, the month of maximum employment, 449 wage earners were reported; and in March, the month of minimum employment, 257; the minimum representing 57.2 per cent of the maximum. The average number of employed during the year was 349 in 1921 as compared with 504 in 1919. A classification of the wage earners with respect to the prevailing hours of labor in the establishments in which they were employed shows that for 68, or 19.5 per cent of the total (average) number, the prevailing hours per week were 48 or less; and for 260, or 74.5 per cent, the hours per week were from 54 to 60 inclusive.

The combined output of all establishments was only approximately 49 per cent of the maximum capacity, based upon a demand requiring full running time.

Two Million Tons of "Glass Sand" Used Annually

A LITTLE less than 2,000,000 tons of sand is used in the United States each year in making glass, according to the experts of the Geological Survey. Plain sand constitutes from 60 to 75 per cent of the body of all glass.

THE QUARRY OPERATOR'S OPPORTUNITY

THREE days filled with practical information-giving talks and discussions have been planned for the quarry and crushing plant operators who attend the National Crushed Stone Association convention in Chicago, January 15, 16, and 17. No progressive owner, manager, or superintendent can attend the convention and measure its educational value without realizing that the convention has been worth to him many times the amount it costs him to attend. Financial, operating, accounting, sales, and transportation problems will be broadly and at the same time specifically covered, and there will be unlimited opportunity to swap experiences with men who have overcome the same difficulties that trouble you.

116,797, in 1921, and to \$1,663,052, in 1919, a decrease of 32.8 per cent.

Six establishments, with products valued at \$315,605, which reported at the previous census are not included in the 1921 figures for the following reasons: Three were out of business; 1 was idle; and two had changed the character of their products and were assigned to other

China's Cement Industry Developing

Her production in 1921 was over 4,000,000 barrels. China's cement consumption is supplied by five native plants together with what is imported from Japan, Italy, the United States and Germany. Three new plants under construction

By Ming Heng Chou

of the Ta Hu Cement Co., Shanghai, China

AS China is developed industrially day by day, the consumption for cement is increasing by leaps and bounds. Last year China consumed over 4,000,000 bbl. of cement for various kinds of uses such as building warehouses, factories, office buildings, sewage pipes, railway stations, river and harbor structures, etc.

The cement consumed in China is partly supplied from importations from Japan, Italy, America and Germany and partly from the following cement plants:

The Keh Sing Cement Works, Tongshan, Chihle, owned by the Chinese.

The Hupeh Cement Works, along the Yangtse river, owned by the Chinese.

The Haiphong Cement Works in Tonkin, Annam, owned by the French.

The Green Islands Cement Works, Hong-kong, owned by the English.

The Tsingtao Cement Works, Tsingtao, formerly owned by Germans.

Because of the enormous demand for cement in China three new cement plants have been started recently and are now in course of completion. The first of the new cement concerns is called the Shanghai Portland Cement Works and was organized about four years ago. It is capitalized at \$2,000,000 (Mex.). The works are situated about two miles from Lunghua, Shanghai.

All of the cement and power machinery, which was bought from the Puerseus Works in Germany, can produce 1200 bbl. per day. The company has engaged three German engineers and a chemist to run the mill. The date of operation will be sometime in the spring of 1923.

The second cement company, which is called the China Portland Cement Works, was promoted by a well-known Shanghai contractor, Yao Shing-Kee. This concern was started about two years ago and was capitalized at \$1,000,000 (Mex.). The cement and power machinery for this plant was also bought in Germany. The plant, situated in Lungtah, near Nanking, can turn out 400 bbl. of cement every day. The company expects to begin operating sometime in the spring of 1923.

The last and the biggest plant is that of the Ta Hu Cement Co., promoted by the noted silk and cotton merchant, Hsieh Ngan-

Min, in Wusih and his eldest son, Hsieh Hsiuehin. The company is capitalized at \$1,500,000 (Mex.). The machinery was ordered from the Humboldt Works in Germany. The power machinery came from the Babcock & Wilcox Co. of Germany.

The raw materials for cement making—the limestone and clay—are very near the plant. The daily output of the plant is 2000 bbl. per day. The date of operation will be some time in the autumn of 1923.

After the three Chinese concerns have started operations the demand for the Chinese cement will be fully met by them.

At present, the price of cement is rather high, about four to five taels (around 75 cents) per barrel. The price of cement, however, will certainly depreciate after the market is flooded with the products turned out by the new cement plants. At the same time the cheapness of cement in China will stimulate its consumption to a greater extent.

The outlook of the Chinese cement industry is today brighter than ever before.

Correction Factor of Standard Cement Samples

DURING the month there has arisen a question as to the clearness of the term "correction factor" as applied to corrections for No. 200 sieves and used in certificates for the same issued by the Bureau of Standards.

Earlier in the year the Bureau of Public Roads sent out portions of a co-operative sample of portland cement to various state laboratories for comparative tests. The results of these tests in several instances showed a lack of knowledge of the proper application of the term "correction factor" for No. 200 sieves, some using it as a multiplier and others to derive a ratio for the correction of the sieve tests. It therefore seems appropriate to devote a little attention to just what is meant by this factor.

The "correction factor" for No. 200 sieves is either additive or subtractive, indicated by the words and signs "plus" and "minus." It is applied to the last operation in the sieve test, the percentage

passing the sieve, and the result of the application is the true fineness of the material which has been tested.

While the wording of the No. 200 sieve certificate in reference to the application of the "correction factor" seems clear, it is thought that confusion may be avoided by eliminating the word "factor." A revision of the No. 200 sieve certificate is therefore being considered. However, it is thought advisable before revising the certificate to make a further study of the laws governing the application of correction factors, over what ranges they are constant, and their variation with the varying degrees of fineness. Although this investigation has been delayed for some time because of the press of work in the laboratories, it is hoped to carry it to completion as soon as possible.

International Cement Co.'s Increased Earnings

CURRENT earnings of the International Cement Co. are said to be at the rate of \$3.50 a share, as against the present annual dividend requirements of \$2.50. The company has three times as much cash on hand as it had at the end of 1921. Although the demands for construction purposes have caused decided improvement in International Cement's affairs, interested people are not looking for any dividend increase, which has been rumored.

Pyramid Cement Co. Increases Its Board of Directors

THREE directors have been added to the board of the Pyramid Portland Cement Co. An announcement made at Des Moines by President Struckman states that the new directors are E. W. Crellin, former president of the Pittsburgh-Des Moines Steel Co.; Amos Pearsall, manager of that company, and W. H. Jackson, its president.

Work on the company's \$2,000,000 plant at Valley Junction is nearing completion and the company expects to start production early in 1923.

Making Cement in Zanesville

A new \$2,000,000 plant, making 2500 barrels a day, is planned for Ohio

A NEW cement plant with a capacity of 2500 bbl. a day will be erected at Zanesville, Ohio, by the Pittsburgh Plate Glass Co. An announcement from F. A. Jones, manager of operations of the Limestone Products department of the company contains many details of the new plant, which will use the wet process and which will start operations, according to present plans, early in 1924.

At the present time the company has an investment of three-quarters of a million dollars in a large crushing plant on the site of the proposed cement plant, and the new plant with its power house, office building, laboratory, machine shops, and homes for workmen will cost approximately \$2,000,000.

A Byproducts Plant

This plant is being erected to use up by-product stone from the present crushing plant, as this plant turns out a large amount of fine limestone screenings for which there is not a sufficiently large market. A large amount of these screenings have to be dumped back in the quarry. About 600 tons a day are available for the manufacture of cement.

The company, last winter, in core drilling its property to ascertain the probable amount of chemical limestone which supplies its chemical plant at Barberton, found that it had 44 acres of high-grade shale averaging about 45 ft. in depth. This shale deposit would supply the cement plant for 125 years.

Besides this deposit of shale there is a layer of shale on part of the limestone that averages 10 to 20 ft. in thickness and has to be removed in order to quarry the chemical stone.

Situated in the center of Zanesville coal fields the plant is assured an abundant supply of coal which can be mined within two or three miles of the plant.

The F. L. Smith Co. have made up and burned samples of the raw products, and the result is a high-grade portland cement which exceeds by 30 to 50 per cent the standard portland cement specifications.

This new plant will be designed and built by the company's own engineers, a force of which will be put to work as soon as suitable quarters can be located.

Two Wet Process Kilns

The buildings will all be of concrete and brick fireproof construction. The kilns, of which there will be two, will be 11 ft. in diameter and 175 ft. long, each having a capacity of 1350 bbl. cement a day.

Powdered coal will be used as fuel for firing the kilns, driers and auxiliary boilers. The two kilns will be fitted with waste heat boilers, so that all the steam will be made from this waste heat to operate the cement plant and the present crushing plant.

Two 1560-k.w. steam turbine generators will be installed to generate the power from these waste heat boilers and will be capable of generating 3500 hp. of electrical energy.

The current will be generated at 2200 volts, 60 cycle, three phase, which will operate all motors from 50 to 500 hp. All motors under 50 hp. will be supplied with current from transformers at 440 volts.

Besides the waste heat boilers there will be one 408-hp. auxiliary boiler fired with powdered coal to be used as an emergency boiler to start the plant up and run until the kilns are properly heated, when the waste heat boilers will supply all necessary steam and the auxiliary boiler will be closed down.

Power of Low Cost

This auxiliary boiler is large enough to run the present crushing plant, so that in case the cement plant is closed down, power is available to run the crushing plant during such period.

This assures the company a large excess of power at all times at a cost per k.w.h. of one-third what it would be able to buy power.

The boilers will be fitted up with superheaters and economizers, and will supply steam at 100 per cent superheat and 175 lb. pressure to the turbines.

A modern office and laboratory will be erected at the plant to quarter the chief chemist and his assistants who will have charge of the raw mixing and the analyses and standard tests of the finished cement.

Ample railroad tracks will parallel the plant on both sides, connecting with the present tracks that serve the crushing plant.

A new and enlarged machine shop will be built in connection with the plant to enable the company to make all of its own repairs.

Six circular cement silos, 40 ft. in diameter and 80 ft. high, will be capable of holding 150,000 bbl. of finished cement. A clinker storage building will hold 80,000 bbl. of finished clinker.

Erect Number of Homes

The company will have to bring in a large force of experienced help to operate the plant, so have provided funds to build 15 to 20 modern homes on its property to house this help.

Marketing the Product

The new plant will have a wide field to market its product, extending to Steubenville on the Ohio river on the east to the Indiana line on the west and north to Cleveland and south to all of the western part of West Virginia.

The product of this new plant will all be marketed by a sales organization, located in the company's present offices in the Memorial building, Zanesville.

The present crushing plant is known as the Limestone Products department, Columbia Chemical division, Pittsburgh Plate Glass Co. The Columbia Chemical division, situated at Barberton, has immense deposits of salt, and in combination with the lime made from the chemical limestone shipped from the Fultonham quarry, soda ash is manufactured for making glass.

Besides the soda ash made at Barberton, they also manufacture caustic soda, chloride of lime, and all the various washing and bleaching compounds.

Bureau of Standards Investigating Molding Sand

THE U. S. Bureau of Standards is conducting a series of tests to discover a sand with 100 per cent permeability. The advantage of finding a perfectly permeable sand or one which approximates perfect permeability is obvious. Having a standard sand with a known permeability, the suitability of every molding sand could be expressed in percentage of a sand found to be 100 per cent permeable.

To accomplish this result, several sands have been investigated. One commercial grade of sand, which is a very pure silica sand of a fairly uniform degree of fineness, has been found on a number of tests, both dry and with as high as 4 per cent of moisture to be 100 per cent permeable. Further tests are being made to determine its colloidal matter or any other substances which might affect its permeability.

"Shot-Firing by Electricity"

A PAPER with the above title, by N. S. Greensfelder, presented at the recent San Francisco meeting of the American Institute of Mining and Metallurgical Engineers, is being distributed by the Hercules Powder Co., Wilmington, Del. This paper is copyrighted by the above-named institute.

How Hydrated Lime Affects the Strength and Flow of Concrete

By Warren E. Emley
of the United States Bureau of Standards

FOR several years past, many reputable investigators have been trying to ascertain whether or not the addition of hydrated lime to concrete is worth while. Their work has resulted in radically different conclusions. Since the integrity of the experimenters is above criticism, it must needs follow that there is a reason for these discrepancies.

To find this reason, 1600 specimens of concrete, with and without lime, and with varying amounts of water and different storage conditions, were tested for compressive strength and "flow." The results

THIS SERIES of experiments, carried on with the thoroughness of the Bureau of Standard's methods, involves 1600 specimens of concrete. It establishes certain important facts concerning the effect on concrete of additions of hydrated lime in various proportions.

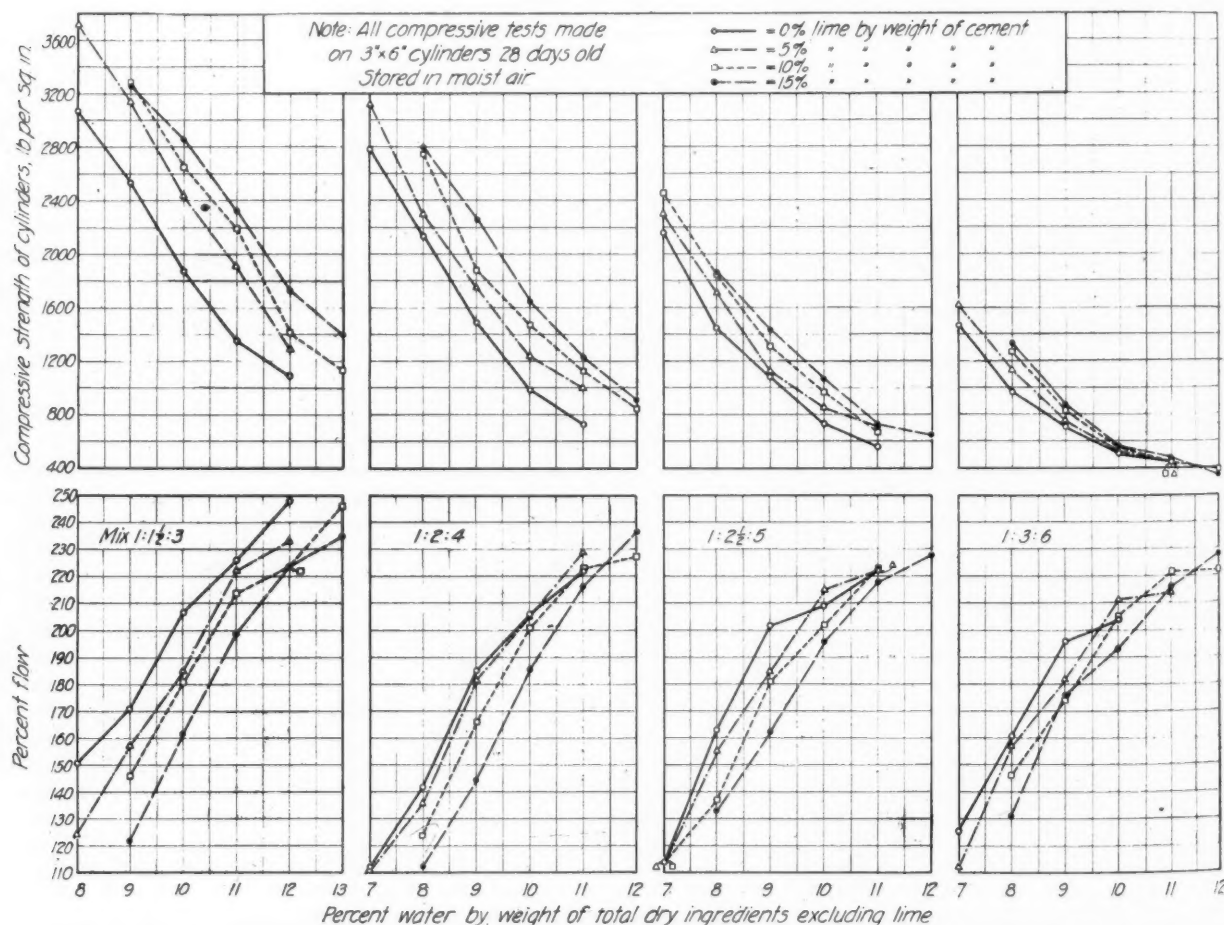
are shown in the accompanying curves. This work was done in co-operation with the Cement Section of the United States Bureau

of Standards. F. A. Hitchcock and J. R. Dwyer of the bureau were largely responsible for its planning and completion.

From these curves the following general truths are obvious:

1. If water, but no lime, is added to a given concrete, the flow will be increased and the strength decreased.
2. If lime, but no water, is added to a given concrete, the flow will be decreased and the strength increased.

These statements bear out the results obtained by other investigators. They are perfectly obvious from the curves, which



These curves, the result of thorough tests, show that added lime gives greater strength but less workability; added water has the opposite effect; the addition of both water and lime may increase, decrease, or have no effect on both factors, depending on the proportions added. Much depends on special conditions of the concrete.

show them to hold practically without exception.

It follows as a logical corollary to the above conclusions that if both lime and water are added to the given concrete, the effect on both the strength and the flow may be plus, minus, or zero, depending upon the numerical values of the factors involved. These factors are three: the character of the given concrete, the change due to the lime, and the change due to the water.

The value of the first factor will depend upon whether the given concrete is wet or dry, rich or lean, and upon the nature and proportions of the aggregate. Any change in this factor may easily mask the effect of the other two. Failure to allow for this point is probably the cause of the noted discrepancies found by different investigators.

To illustrate the conclusions given above, as well as the method of using the curves, the following examples have been selected:

1. Given a 1:2:4 concrete, 8.05 per cent water. This has a flow of 150 and a strength of 2100. What will be the effect on the strength if lime is added with enough water to keep the flow constant?

Per Cent Lime	Per Cent Water	Flow	Strength
0	8.05	150	2100
5	8.3	150	2130
10	8.6	150	2250
15	9.15	150	2200

2. Given a 1:1½:3 concrete 9.05 per cent water. This has a flow of 172 and a strength of 2500. What will be the effect on the flow if lime is added with enough water to keep the strength constant?

Per Cent Lime	Per Cent Water	Strength	Flow
0	9.05	2500	172
5	9.85	2500	176
10	10.3	2500	187
15	10.65	2500	183

In both of the above examples, the addition of 10 per cent lime is apparently beneficial, but the effects are within the probable experimental error. This fact may be emphasized by a third example:

3. Given a 1:2½:5 concrete, 9 per cent water. This has a flow of 202 and a strength of 1007. What will be the effect on the strength if lime is added, with enough water to keep the flow constant?

Per Cent Lime	Per Cent Water	Flow	Strength
0	9	202	1007
5	9.55	202	997
10	9.95	202	997
15	10.2	202	1000

Obviously, such examples could be repeated indefinitely, but enough have been cited to warrant the following conclusions:

The effect of hydrated lime on concrete will depend first of all on the properties of the concrete, whether wet or dry, rich or lean, on the nature of the aggregate, and so on.

The effect of the addition of lime and the effect of the addition of water will be in opposite directions. The net effect when both are added will be an algebraic sum, and may be plus, minus, or zero, depending upon the relative magnitudes of the effects

of each, acting separately. This in turn will depend, not only on the amounts of lime and of water, but also on the properties of the original concrete.

From the above discussion, it is seen that the effect of hydrated lime on the strength and flow of concrete depends somewhat on the amount of lime added, somewhat on the amount of water added to compensate for the lime, but chiefly upon the initial character of the concrete to which the lime and water are added.

On the assumption that the flow table is the best present method for measuring the workability of concrete, it would seem fair to compare the strength of concretes having equal flow. However, we have long recognized the limitations of the flow table and are continuously striving to devise some modification of the flow test that will differentiate between mixtures having the same flow but of varying quantities of component materials, which in themselves affect the workability.

Bernard L. McNulty Becomes President Marblehead Lime Co.

THE Marblehead Lime Co., with headquarters in Chicago—an old established lime company with six plants at various



Bernard L. McNulty

points in southern Illinois and Missouri—has recently been entirely reorganized and Bernard L. McNulty, formerly general manager of the Lehigh Lime Co., has been elected president to succeed B. B. Williams. J. King McLanahan of Hollidaysburg, Pa.,

one of the directors of the American Lime and Stone Co., has been elected vice-president, succeeding R. A. Long; Will J. Stewart, vice-president of the old organization, remains vice-president of the new organization with headquarters at Kansas City, Mo. The secretary and treasurer is R. S. Peotter. The assistant treasurer is F. H. Belden and the assistant secretary, M. J. Kinder. The other members of the staff are the same as in the old organization.

The plants are located at Quincy, Ill., Springfield, Mo., Marblehead, Ill., Hannibal, Mo., Louisiana, Mo., White Bear, Mo. The reorganized company includes a consolidation with the Hannibal Lime Co., which was formerly owned by the same parties. The new company is the largest producer of high calcium lime west of Ohio.

Bernard L. McNulty is one of the directors of the National Lime Association and one of its leading lights, particularly in the chemical field. His introduction to the lime business was as an associate editor of ROCK PRODUCTS. He was then impressed with the possibilities of the industry for a young man and it is no less a credit to the lime industry than to him that he has attained the position of chief executive of one of the largest lime companies while still a young man.

Highway Contract Practices

HIGHWAY officials and contractors for road construction acting through their national associations have exhibited a disappointing inability to co-operate. Late in 1919, when the joint committee to consider contract practices was created by the Associated General Contractors and the American Association of State Highway Officials, every indication was had that the action had the warm approval of the membership bodies of both associations.

There is no reason to believe that this sentiment has altered, yet for almost three years the committee has failed to function in any constructive manner. No reports, beyond a perfunctory statement once a year of "progress," have been made. It seems high time to ask the reason for this failure. An answer is needed, particularly because rumors persist that intolerance within the committee is chiefly responsible. As the subjects for consideration have been formulated by contractors, as outlined in this issue, they are certainly not impossible of discussion in good temper.

The committee will have another opportunity previous to the convention of the American Association of State Highway Officials in December to arrive at conclusions which will serve at least as a basis for discussion. It will, in fact, be disappointing if there is not a much more definite accomplishment to be reported.—*Engineering News-Record*.

National Crushed Stone Association Tentative Program at Chicago,

PLANs are rapidly maturing for the program of the National Crushed Stone convention. Below is the tentative program agreed upon by the program committee, consisting of W. Scott Eames, Wm. H. Hoagland, John J. Sloan, A. P. Sandles, Nathan C. Rockwood, chairman.

President of Chicago and North Western Railway to Be Guest

William H. Finley, president of the Chicago and North Western Railway, a prominent American civil engineer, as well as one of the foremost railway executives, has already accepted an invitation to attend the annual dinner on Tuesday evening. C. E. Spens, vice-president in charge of operation of the Chicago, Burlington & Quincy railroad, and at present Federal Fuel Administrator at Washington, D. C., has also accepted an invitation to attend. Other prominent railway executives are expected to be there.

A number of excellent papers have already been promised, but as Tuesday's session will be largely spontaneous contributions, suggestions are in order. The chairman of the program committee earnestly solicits these suggestions from every reader. Who are willing to bring lantern slides of their operations? Who will come prepared with itemized cost figures? Who have special knowledge on some of these different items of operation?

If these suggestions do not come voluntarily soon, the chairman of the committee is going to put a system of *selective draft* into operation.

Program

MONDAY, JANUARY 15

10:00 A. M.

1. President's Address
2. Secretary and Treasurer's Report
3. Report of Research and other standing committees
4. Talk of representative of U. S. Department of Commerce or Interstate Commerce Commission on Transportation Situation
5. Talk on Transportation Situation from the point of view of the railroads by prominent railway executive.

12:30 A. M.

Luncheon by Groups (separate rooms)
Agricultural Limestone Producers
Ballast Producers
Concrete Aggregate Producers
Granite Quarry Men
Machinery, Equipment and Material Manufacturers

AFTERNOON SESSION

2:00 P. M.

1. Paper on "Information and Data

That a Banker Wants to Know About a Quarry Operation Before He Will Help Finance It." By a prominent Chicago banker

2. Paper on "Valuation of Stone Deposits Including Exploration of Quarry Property Geological Data, Exploitation Possibilities, etc." Designed to bring out the factors in a stone deposit which make it worth developing as a crushed stone property; and to furnish some basis for a reasonable valuation of undeveloped quarry property, taking into account a study of markets and commercial possibilities as well as the geology, quality of stone, etc.
3. Full and complete discussion from the floor of subjects 1 and 2 above

TUESDAY, JANUARY 16

10:00 A. M.

The entire day to be devoted to full and complete discussion of "Quarry Operation" under the following heads:

1. Stripping
2. Drilling and Blasting
3. Handling Stone in Quarry
4. Quarry Transportation
5. Primary Breakers
6. Secondary Breakers
7. Screening and Sizing
8. Storage and Shipping

Each one of these subjects will be handled by a paper contributed by some one who has had special experience in that particular subject or who is particularly well posted on the field as a whole. The discussion of each subject is to be led by two or three others who have come prepared to discuss the paper presented. It is the intention to have the original paper on each one of these eight subjects placed in the hands of the chairman of the program committee at least three weeks prior to the convention. These papers will be edited, printed and distributed to each and every member, if possible, several days prior to the convention, so that the time of the convention can be devoted largely to a free-for-all discussion of these subjects, the papers being read merely by title or in the form of a brief synopsis.

TUESDAY LUNCHEON

12:30 A. M.

Luncheon by Territorial Groups, Eastern, Central, Southern and Western

2:00 P. M.

Continuation of morning program

WEDNESDAY, JANUARY 17

10:00 A. M.

Discussion of Quarry Management

1. Cost Accounting Methods
2. Overhead, Depletion, Depreciation, Insurance, etc.
3. Cost Experience—Summaries of Cost

These subjects will be covered by a general paper contributed by one or more operators, and will be fully discussed on the floor at the convention

11:00 A. M.

Merchandising Quarry Products

1. Sales Organization
2. Sales through Dealers—Allowance for commission, etc.
3. Prices and Discounts
4. Effect of Car Shortage and Traffic Uncertainties, etc.

12:30 P. M.

Luncheon

General get-together, wind-up Luncheon

WEDNESDAY AFTERNOON

2:00 P. M.

Discussion of Uses of Crushed Stone, Road Stone and Concrete Aggregates—paper by representative of the U. S. Bureau of Standards and prominent highway engineers

2. Railway Ballast—Paper or talk by representative of the American Railway Engineering Association Committee on Railway Ballast
3. Fluxing Stone—Paper or talk by prominent Iron or Steel Chemist on kinds of fluxing stone and their particular uses
4. Agricultural Limestone—Paper or talk by Agricultural Experiment Station man or some prominent user of agricultural limestone
5. Special Uses of Crushed Stone—Paper by prominent operators on various minor uses of crushed stone, such as chicken grits, patent roofing, pebble dash, etc.

Election of Officers

In developing this program it is the intention to make the first day, Monday, a more or less general discussion day, with papers by prominent outside experts on transportation, finance and valuation.

Tuesday will be devoted entirely to a comprehensive discussion of every phase of quarry operation in which it is hoped every man at the convention will get up and relate his own experiences, costs, methods, etc., in respect to each of the eight items, stripping, drilling and blasting, handling stone, quarry transportation, primary breakers, secondary breakers, screening and sizing and storage and shipping. Also machinery men can take a big part in this day's program.

Wednesday forenoon will be devoted to the discussion of problems of management and merchandising, largely by quarry operators themselves; and Wednesday afternoon mostly to papers or talks by outside experts—users of crushed stone.

Calcium Arsenate Shortage Threatened

THE fertilizer industry is vitally interested in the cotton farmer obtaining sufficient calcium arsenate to protect his crop from the boll weevil, writes C. A. Whittle, editorial manager, soil improvement committee, Atlanta, Ga. in the *American Fertilizer*. While the cotton farmer has not yet come into the market for calcium arsenate, dealers and agents who contemplate handling this material, are finding it impossible to contract for the amount for which they feel they can find a ready market. In a word, the indications are that there will be a shortage of calcium arsenate in 1923. When one considers that the cotton farmers' demand has suddenly arisen to proportions far in excess of all demand that hitherto has existed, it would be surprising if a shortage did not arise.

The Farmers' Real Trouble

If it were possible to increase the size of the calcium arsenate manufacturing plants as to turn out quickly a sufficient amount of the finished product, there remains a shortage of white arsenic, which is not to be turned out in largely increased quantities in short order. A white arsenic shortage is in fact the real trouble that confronts the cotton farmer.

Where and how is white arsenic produced and what are the possibilities of increasing the output? Commercial arsenic is largely a byproduct of smelters that handle copper, silver and other ores. Its recovery from the fumes has been enforced because of arsenic being a public nuisance when released in the atmosphere.

By the modern Cottrell process of electrical precipitation the crude arsenic is collected from the smelter flues. In its crude form its content of arsenic oxide—white arsenic—runs from 40 to 90 per cent. To render it marketable as white arsenic it has to be refined to run 99 per cent As_2O_3 . This refining is done in volatilizing furnaces, but the percentage and character of the impurities and the difficulties of refining are so great with some of it that the manufacturers put on the market an off-grade product running between 90 to 99 per cent. None of this is suitable for the manufacture of calcium arsenate.

Smelters, of course, are not to be looked to for an increased output of white arsenic. Their primary product is something else, and white arsenic is only a byproduct and of minor consideration. Being a byproduct, the cost of production is low, so low that to undertake the manufacture of white arsenic direct from arsenical ores may not be profitable. A chemical engineer who has made a study of the manufacture of white arsenic, stated in *Chemical and Metallurgical Engi-*

neering of June 21 1922, that attempts have often been made to produce white arsenic from low-grade iron ores but never with sufficient success to make it profitable, unless the price of white arsenic should reach 12 to 14 cents per pound, which is about twice the price at which it has been selling. He does not think the cotton farmer could afford to pay that much and believes that the full development of calcium arsenate as a spray for the boll weevil awaits the time when white arsenic can be made and sold at less than 6 to 7 cents per pound.

A Short Cut to the Final Product

He holds out hope in the following statement: "A short cut to the final product precludes the process of extracting arsenic as As_2O_3 and its subsequent oxidation to As_2O_5 and requires an ore in which the arsenic is present in its natural state as an arsenate instead of an arsenite."

Only one known deposit of arsenate is known in the United States. As to its development he says: "A considerable saving in final cost would result should it prove practicable to produce the commercial arsenical sprays such as calcium and lead arsenate direct from arsenical ore, without the successive steps of refining white arsenic and converting the arsenic to acid before combining with the lime or lead."

Some Official Figures

Official figures show that the present production of white arsenic in this country is 12,000 tons annually. It is estimated that this country consumes more than it produces; in fact, has been using 16,000 tons. Of this amount 80 to 85 per cent has gone into insecticides, dips, weed killers and the like. Most of the remainder is used by the glass industry.

Perhaps some relief may be obtained from imports. Several countries produce white arsenic. Canada, Japan, Germany, Mexico and Belgium exported white arsenic this year. Formerly Spain and England exported arsenic to this country, but are not now in position to do so. Other countries manufacturing it are only producing enough for home consumption. All told, the world capacity for the production of calcium arsenate is only 30,000 tons.

For every 100 lb. of calcium arsenate, approximately 40 lb. of white arsenic is required. If the urgent demand would increase the available supply in this country from the present 16,000 tons to 18,000 tons in the next year or two, and if we figure that there would be perhaps 75 per cent of it available for calcium arsenate, there would be 13,500 tons of white arsenic. This amount

of white arsenic would produce 33,750 tons of calcium arsenate.

Applied at the rate of 20 or 25 lb. to the acre this amount of calcium arsenate would treat 2,700,000 or 3,375,000 acres of cotton. It will never be practicable to apply calcium arsenate to every acre of infested cotton land, because many acres produce too poorly to justify the added cost of applying calcium arsenate, and also because boll weevil infestation will never be bad enough on every acre to require its application. While the 2,700,000 or 3,375,000 acres that it seems can be treated represent a small part of the total acreage devoted to cotton, it may not be far from the number of acres it will be possible to get the cotton farmers to treat in the next year.

From this discussion it is obvious that the cotton industry is up against a white arsenic problem. Can the chemical and metallurgical genius of the country rise to the occasion and produce more and cheaper arsenic?

Erosion Cavities in Limestone Deposits

THE limestones of the Shenandoah valley of Virginia and West Virginia are characterized by numerous solution cavities brought about by surface or subterranean stream erosion, states the Federal Bureau of Mines. The quarryman's difficulty is due to the occurrence, even at considerable depth, of erosion cavities, not in the form of open spaces, but filled with red clay. These clay masses are troublesome, and their removal is costly.

The problem is of general interest to all limestone quarrymen, for erosion cavities are characteristic of limestone deposits, though they are not generally developed as much as in the district under consideration. Some form extensive caverns in which part of the dissolved calcium carbonate (limestone) has been redeposited as stalactites and various other ornate forms.

Some of the caverns have been illuminated and opened to the public as commercial enterprises. In a few instances the cavities constitute a commercial asset in the valley, yet from the quarryman's point of view they are a decided disadvantage, for they constitute one of his hardest problems. A discussion of stripping problems in limestone quarries in the Shenandoah valley is contained in Serial 2401, by Oliver Bowles, mineral technologist, which may be obtained from the Bureau of Mines, Washington, D. C.

A Correction

IN the second installment of "Production Costs of Rock Products," by Dr. Oliver Bowles, under the illustration showing the equipment in a New Jersey quarry, in *Rock Products* of November 4, the type made us say, "This equipment handles 170 tons of rock per day." Of course it should have been "1700 tons."

Hints and Helps for Superintendents

A Telescoping Spud

THE Granite Sand and Gravel Co., Indianapolis, Ind., has in use on its dredge a novel type of spud, made up of sections of wrought iron pipe telescoped, which is raised and lowered by an electrically controlled hoist.

The spud is made up of three sizes of pipe: A 12-in. section 20 ft. long, a 10-in. section 19 ft. long, and an 8-in. section 18 ft. long. The sections are put together in telescope fashion, and collets so arranged on the inside and outside of each section as to prevent them from slipping out of each other. To the upper end of the 12-in., or lower section, when extended, is attached a $\frac{3}{4}$ -in. cable which passes through a sheave mounted on an A frame, which serves as a guide for the spud. From this sheave the cable passes through another sheave secured to the deck, thence on to the drum of a hoist. In this way the spud is raised and lowered economically, and when raised does not extend in the air as does the common one-piece timber type spud. Another point in favor of the telescopic spud is that the original cost is very small as pipe that would otherwise be in the scrap pile may be used to construct it.

Working Rain or Shine

STOKE and lime producers in many sections, especially during the car shortage, find it necessary to store stone rather than to lay off men. This storage may be made either before the stone goes through the plant or afterward, as conditions warrant.

In the case of the Blair Limestone Co., Martinsburg, W. Va., storage is provided for the stone as it comes from the quarry, before going to the kilns, as well as storage for the lime after being manufactured.

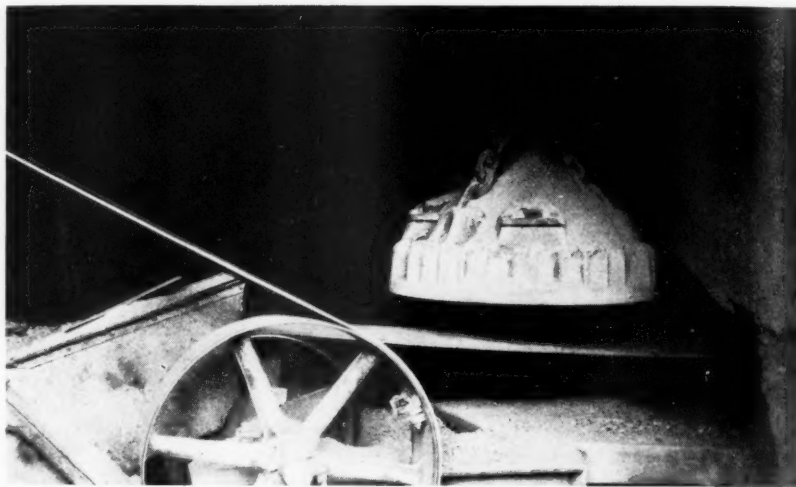
Having in mind the rainy days, an official of the company conceived the idea of a covered storage space for the raw material.

The accompanying illustration shows the

structure evolved from the idea. Under this roof is ample room for the storage of many thousands of tons of stone which may be loaded in bad weather and when conditions will not permit labor in the quarry.

The storage may also be called upon in such emergencies as a wreck or broken-

operators, and has been the cause of much worry and deliberation as to how to overcome it. Spikes, nails, bolts, nuts, and washers, and other iron and steel pieces fall out of the quarry equipment, unbeknown to those in charge, and, along with the stone, pass through the different opera-



Lifting magnet suspended over the discharge end of conveyor belt takes off any scraps of iron or steel that would otherwise go into the mill

down equipment in the quarry; when something goes wrong at the kilns, or it becomes necessary to shut down for a few days.

Cars loaded from the storage supply are moved by gravity to the foot of the incline, where they are handled in the same way as those going direct to the kilns from the quarry.

Protecting the Pulverizer

MANY delays and much damage have been caused in stone pulverizing plants by scraps of iron and steel going into a pulverizer. Ever since pulverizers have been in use, this problem has confronted

tions and eventually into the grinding mill. In some types of pulverizers a nut or spike will choke the mill, resulting in breaking the machine or damaging the power equipment. In other types, a piece of iron or steel will rip a hole in the screen, thus causing oversize material to pass through and mix itself with that properly screened, making necessary regrounding the whole amount.

The Carbon Limestone Co., Hillsville, Pa., has in use the latter type of mill, and is overcoming this problem by the installation of an Ohio lifting magnet, suspended over the conveyor belt which discharges into a Bradley pulverizer. The magnet was sus-



This roof permits the quarry and kilns to operate independently



How the nozzle rides to work

pended as close to the belt as the passage of material would permit, so that should a piece of metal be discharged on the belt, the magnet draws it off, thus avoiding possible damage to the mill.

This method is also in use at the Hagers-town, Md., plant of the Security Cement and Lime Co. The accompanying illustration shows how this company has installed a magnet over a conveyor feeding into a W7 Pennsylvania hammer mill.

Making the Nozzle Ride to Work

IN many quarries a certain amount of washing is necessary before the stone can be loaded into quarry cars, because of small mud seams or pockets, which only appear occasionally and not of such proportion as to justify washing equipment in the screening plant.

At such quarries is usually employed a large hose and nozzle supplied with sufficient water pressure to separate the mud from the stone. In such a quarry the nozzle, which is connected to the water line in ball and socket fashion, is usually mounted on skids and dragged from point to point by several men or a horse.

This was the method which has been employed by the Greer Limestone Co., Greer, W. Va., for many years, but recently, however, a pair of buggy wheels were added to the equipment, as shown in the illustration on opposite page and the nozzle is now moved about by one man in less time than formerly.

Inexpensive Automatic Valve

A VALVE which automatically shuts off the flow of water into a supply tank when it becomes full is in use at the plant of the Universal Sand Co., New Castle, Pa. This idea of converting a globe valve into an automatic valve is an original one on the part of one of the company's employees.

The threads were filed off the valve stem, making the entire surface of the stem smooth enough to permit the stem and seat to move freely up and down without turning the stem. The hand wheel was removed and a rod, the same diameter as that of the stem, and with a length equal to the depth of the tank, was secured to the stem. Then the valve was fitted to the end of the line coming in over the top of the tank, with the extended stem downward.

A wooden float, with a hole bored in it a fraction of an inch larger than the diameter of the rod, was mounted on the rod in such a manner that it could slide freely up and down the rod. At a point on the extended stem corresponding with the maximum water level desired, a collet was attached large enough to stop the float from sliding higher on the rod. Thus, when the tank becomes full, the float comes in contact with the collet,

which is secured to the stem and pushes the entire stem upward, closing the valve.

By the use of the valve, the tank is always filled and a man is relieved of the responsibility of seeing that the tank is kept full, which necessitates going to it several times a day to see how much water is in it.

Using Rails for Holding Revolving Screens in Place

THE Kelly Island Lime and Transport Co., at its Martinsburg, W. Va., plant, is using railroad rails as longitudinal members of the frame to which the perforated revolving screen sections are attached, as shown in the illustration.

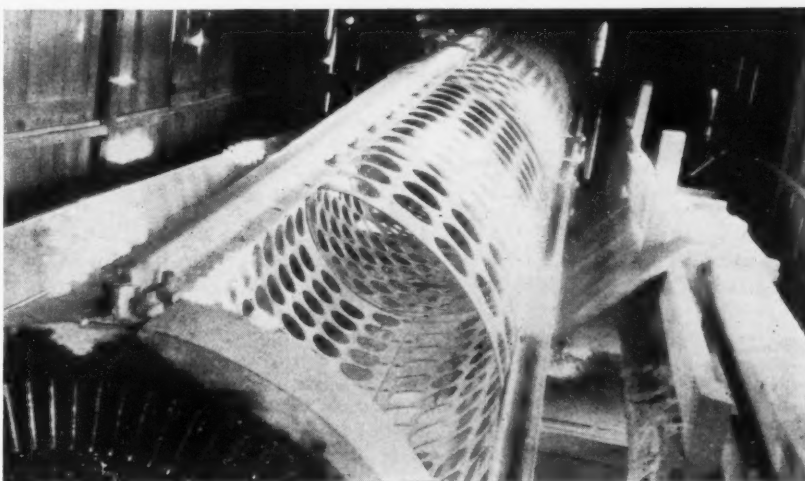
This idea presented itself at the time when it was discovered that in remodeling the plant to increase its capacity, an-

other section of screen should be added. This would ordinarily necessitate ordering new longitudinal members from the factory, and causing unwonted delay. It was then that Superintendent W. J. Donahar thought out the idea of using the rails. In installing them, provision was made for the future installation of another section, in addition to the one required at the time.

behind the buckets at the head pulley, and that as the bucket discharged, the bottom side of it left the belt, causing a space between the bucket and the belt into which the stones from the next bucket would fall.

In the way of an experiment, one of the buckets was taken off and two new rows of holes were drilled about one inch below the original two rows, the original rows being across the center of the bucket. The bucket was again mounted on the belt, using the new holes, and as expected, the bottom of the bucket, after discharging, did not leave the belt enough to permit a stone getting in between.

As a new belt and buckets were needed at that time, the new buckets were ordered with the holes drilled 1 in. below the center of bucket. This new belt was put on over three years ago and it is



How railroad rails may be used in revolving screen assembly

estimated the belt will serve four or five years more, as no wear of any consequence is apparent.

Novel Safety Guard

AT one of the crushing plants of the Marble Cliff Quarries Co., Columbus, Ohio, a hinged railing is installed at the foot of a stairway. When lowered, this railing serves as a warning to any one desiring to go up the stairway that the crusher feeder is about to put off a blast to break an oversize stone for the crusher. The stairway, to which this railing is attached, leads from the ground to the floor level of a gyratory crusher.

Before the railing was placed on the stairway, several serious accidents were narrowly averted merely by sheer good fortune. With this arrangement when the crusher tender intends to blast he merely releases a cord, which passes through a small pulley and which is attached to the railing. This drops the railing by its own weight, thus blocking the entrance to the stairway.

Increasing the Life of Elevator Belts

THE replacing of elevator belts is necessary at the average crushed stone and sand and gravel plant about every two years, and it is generally admitted that the greater part of the wear is caused by stones getting between the belt and buckets, cutting through the belt as it passes over the pulleys.

Observation on the part of Mr. Lamona, of the Concrete Materials Co., Columbus, O., showed that the material got

Questions and Answers

1. Amount of Water Needed for Washing.—I own a deposit of gravel and sand on which I contemplate building a washing plant. The only water supply available is from a creek and it is estimated that this flows from 800 to 1000 gal. per min. except in extremely dry or wet weather. Is this enough to wash 1000 yd. per day? 2. Can any of the water be used over again?—A. E.

A.—Probably not, unless some of the water is reused. A rough rule is to figure 1 gal. per min. for each yard of daily production, but most plants use much more than this; twice this quantity is often used. The amount of water needed for washing depends upon a number of things, the amount of clay to be removed, the proportions of gravel and sand, and the minimum of clay permitted in the washed product being of the most importance; therefore, no rule can be given which will cover all cases.

The reuse of water in washing operations is a very common practice. The waste water from the plant is run into a dam in which the clay settles out and from which the clear water overflows to the suction of a pump which returns it to the plant.—E. S.

2. How Close Should Separation Be?—I have read with interest *ROCK PRODUCTS'* articles on stationary screens and am thinking of putting in one to separate gravel from sand. How close a separation should this screen make?—H. J. F.

A.—As close as any screen, provided sufficient screening area is given and that the screen is properly installed. Passing the oversize (gravel) over a second or perhaps a third screen may be necessary to get out all the sand.—E. S.

3. When Practical to Wash "Stone Dust."—Would it be practical to wash "stone dust" ($\frac{1}{4}$ in. down) in the same kind of plant that is used for washing sand and gravel?—C. E. J.

A.—Yes; with some modifications. The wear from crushed stone is greater than the wear from sand and gravel, and this must be allowed for in constructing the plant. It is sometimes necessary to scrub stone dust more thoroughly than sand and gravel to remove the adhering clay.—E. S.

4. How to Arrange Stationary Screens.—We are contemplating installing a screening and washing plant to produce gravel and sand mainly for state road work. Our gravel runs very little over 2-in. size; at times it runs up as high as 50 or 60 per cent. In this plant the discharge line will be 12 in. and the top of the apron about 40 ft. above ground level. After being discharged on the narrow part of the apron the gravel spreads out and shoots down the apron to a stationary screen, which is at least 20 ft. wide and strikes this screen just like Fig. 7,

page 20, of your October issue, which Mr. Shaw states is not correct. This is a heavy wire screen and separates all above $\frac{1}{4}$ in. from the sand. From here the gravel goes to two revolving screens which grade it up to state specifications and the sand goes into a settling basin or else back with the water overboard. For blast or traction sand another baffle screen is placed back of the stationary screen and separates the coarse sand from the fine. This plant will be built so that three cars can be placed under it and the different sizes discharged direct into cars. Tell us how we could redesign this plant to have the stationary screens placed in a way which Mr. Shaw recommends? Would conical screens be any better than the standard designed stone screens with dust jacket? We have been told by a sand man that revolving screens do not work correctly in screening blast sands to the different grades; that we should build a tower and use inclined gravity screens where a man can go over them and sweep away the obstructions. What is the best type of screens to use?—G. E. A.

HOW THIS PAGE WILL HELP

ON this page questions of general interest on quarrying, crushing, screening, washing, burning, transportation, and other operating and marketing methods in the production of lime, cement, stone, gravel, sand, gypsum, and other rock products will be answered by specialists in the various branches indicated. Questions should be addressed to the editor.

A.—Without being on the ground it is impossible to say just how you should arrange the stationary screens to get the best results. We advise that you read carefully that part of the article on stationary screens which speaks of the pitch of the screen and its importance. As to feeding, that is only a matter of changing the screen so that the feed comes over the top. With any stationary screen it may be necessary to rescreen the gravel, as the state specifications for road material in New Jersey are very rigid, especially as to the amount of sand permitted in the gravel.

Revolving screens will work in separating blast sand into the required sizes. A plant not far from you uses them successfully for this work. The writer's preference would be a classifying plant if the separation is to be made wet and some form of vibrating screen if the separation is to be made dry. Fine revolving screens give a lot of trouble from blinding and wear out the screen cloth pretty rapidly.

The inclined gravity screens will do excellent work on dry material if they are properly installed and if enough screen area is included in the installation.

There is no reason why conical screens should do any better work than cylindrical screens. Theoretically, it ought to be the other way about, for the cylindrical screen has a constant speed throughout its length, while the conical screen travels much faster at the big than at the small end. Conical screens are so much used in sand and gravel plants, not because they do better work but because they make a simple installation with a single drive for the whole series. See installment No. 3 in this issue.—E. S.

5. Efficiency of Oil Fuel.—We desire some information as to the actual consumption of fuel for the manufacture of lime in actual modern practice. How many gallons of fuel oil are spent per ton of 2000 lb. of lime, including the oil spent in the boilers for producing the steam used in atomizing the oil? We are lime producers and have a plant of six kilns.—M. Y. R.

A.—There is but little available data on the fuel efficiency of oil fuel in lime burning. Practically all such installations are in rotary kilns, which are much less efficient than shaft kilns. A great deal depends on the character of the oil. It is ordinarily figured that a barrel of oil for lime burning is equivalent to from $\frac{5}{7}$ to $\frac{7}{9}$ of a ton of good bituminous coal.

If we take a ratio that a barrel of oil (or $31\frac{1}{2}$ gal.) is the equivalent of $\frac{5}{7}$ of a ton of coal and assume that a ton of coal will burn 5 tons of lime, including the coal burned to produce steam for the kiln (the best practice in America and far above the average), we find that it would require 8.8 gal. of oil per ton of lime, including the oil burned to make steam for the kilns.

If a barrel of oil is equivalent to $\frac{7}{9}$ of a ton of good bituminous coal, it would require 8.1 gal. per ton of lime burned. As stated, a ratio of five tons is considerably above the average of the shaft lime kiln; a more common ratio is four tons. On this ratio it would require 20 per cent more fuel, or 11 gal. per ton of lime.—N. C. R.

6. Sand for Sand Blasting.—Can you give me some idea of the chemical properties a silica sand must contain to be suitable for sand blast?—D. F. R.

A.—Sand for sand blasting varies somewhat in different parts of the country. New Jersey sand contains 98 per cent or more SiO_2 . It is considered of more importance than the chemical analysis that the sand should be made up of firm, round grains, as these have so much greater cutting effect when used with the blast.—H. E. H.

Sand and Gravel Producers Adopt New Constitution

Organization changes its name and makes other radical changes in its constitution

A SPECIAL convention of the National Association of Sand and Gravel Producers, held in Chicago on November 15, was the result of a meeting of a reorganization committee held in Chicago on June 21 and 22, at which time a proposed constitution was drawn up. This constitution, after the addition of several amendments, was adopted by unanimous vote. A resolution was passed that the changes made in the constitution shall become effective as soon as practical, but no later than the date of the next annual meeting.

The name of the organization was changed to the "National Sand and Gravel Association." A section was added to one of the articles of the proposed constitution providing that any individual, firm or corporation, not a producer of mineral aggregates, but interested in the activities of the association, may become an associate member, without voting privileges, upon payment of the sum of \$50 per annum.

It was unanimously voted that the annual assessment shall be due and payable in 12 equal monthly installments and shall be based on the previous year's production.

It was also voted that the executive committee of the association may accept as individual members the membership of any regularly organized state or district association.

If the state or district association pays in full the dues of its entire membership within 10 days from the date on which dues are due, then the local association shall be allowed a discount of 25 per cent on the regular rate of dues.

It was further voted that a special meeting of the association or the board of directors may be called by the president, or by five members of the board of directors, at any time, upon due notice and statement of the purpose of the meeting. Special meetings of the executive committee may be called by the president or by three members of the executive committee at any time upon due notice and statement of the purpose of meeting.

An amendment to the proposed constitution provides that the board of directors shall choose from their own number four members who, together with the president, vice-president and secretary-treasurer, shall constitute the executive committee, which shall actively conduct the affairs of the association and carry out the specific plans of the board of directors in the interim between the meetings of the latter body.

The reorganization committee which drew

up the proposed constitution was composed of 16 men representing the following 15 states: Ohio, Minnesota, Alabama, Wisconsin, West Virginia, Indiana, Michigan, Kentucky, Iowa, Illinois, Pennsylvania, Tennessee, Missouri, New York and Nebraska. This committee divided the United States into 26 districts and provided that each district shall select five delegates and five alternates to the annual convention. The management of the association will rest with a board of directors, to be chosen by the members in each of the 26 districts.

It was also voted that the association become incorporated. This issue received much consideration and comment by several members present, but no definite date was decided upon and also it was undecided as to the state in which the association should become incorporated.

Prior to the luncheon recess, John Prince, secretary-treasurer of the association, presented ex-President V. O. Johnston a beautiful white gold watch. It was resolved that the inscription, "They have rights who dare to maintain them," be inscribed in the watch. The members present, together with representatives of the technical press, were the guests of Bradley S. Carr, of the American Manganese Steel Co., at luncheon in the Blue Fountain room of the LaSalle hotel.

Following the adjournment of the convention, a meeting of the executive committee was called for the purpose of deciding upon the date and the place of the next annual convention. It was agreed it should be held on January 24, 25 and 26 and that the question of the place of the meeting should be submitted to a referendum vote of the membership. A general discussion of this subject during the convention showed that the next meeting probably will be held either in St. Louis; French Lick, Ind., or in Washington.

You Should Know the "Crecco-Splaths"

ONE of the vice-presidents of the du Pont Co., Col. W. C. Spruance, in a lecture delivered recently at Princeton University, outlined an interesting compilation of personal characteristics which corporations and employers generally want their men to possess. Basing his remarks upon the requirements set forth in du Pont employment blanks, he said:

Here is a more or less typical presentation of this phase of your problem. There

are 13 desirable personal characteristics which will be found to be valuable assets. I have called them "Crecco-Splaths," which is a word coined from the first letter of each of the thirteen when arranged in the following order:

CO-OPERATIVE. None can succeed alone; success is the sum total of the successes of all the members of any organization minus their failures. Give and take assistance; be willing to help, and open to suggestion; eager to try any new idea or scheme that offers a possible advantage.

RESOURCEFUL. Don't be afraid of difficulties, nor dismayed by temporary setbacks; show backbone and persistence to overcome obstacles.

ECONOMICAL. Guard against waste, be saving of time, effort and materials and suggest more economical methods to your employer.

CAREFUL. Avoid loose methods in the office or on the road, or recklessness in field or mill operations.

COURAGEOUS. Have the courage of your convictions, and give your real opinion when asked, even if it seems to be on the unpopular side. He who sidesteps responsibility reveals unfitness for responsibility.

OBEDIENT. Each employee is a private or officer in an industrial army. By following instructions wholeheartedly and explicitly, you will qualify as an executive.

SYSTEMATIC. United, efficient work is possible only through system. Systematize your own work, study all instructions, and religiously follow the system in effect.

PROGRESSIVE. Be modern, keep up-to-date; those in a rut or likely to fall into one are not wanted.

LOYAL. Recognize the mutuality of interest of your employer and yourself.

AGGRESSIVE. Brains and energy are wanted; pushers who insist on results and have the physical and mental qualities to produce them.

TEMPERATE. Conserve your brain and body by reasonable and proper habits so as to maintain always a high standard of efficiency. Carousing, late hours and fast living soon result in elimination.

HONEST. All other qualifications fail if this is lacking.

SINCERE. Flatterers, traducers, tale-bearers, or traitors are not wanted. No criticism of any employee, officer, or competitor is desirable that may not be honestly made face-to-face and for the intended benefit of the accused.

John Price Now with American Oil Corp.

JOHN PRICE, who has been active in the cement industry for many years, has entered the service of the American Oil Corp., Jackson, Mich., in the capacity of sales-engineer, specializing in cement mill lubrication.

For 16 years Mr. Price served the Peninsular Portland Cement Co., of Cement City, Mich., the first six years having charge of the power house and the latter 10 in the capacity of general superintendent. He was also general superintendent of the Rockwood Silica Co., Rockwood, Mich., from 1916 to the spring of 1919 and left that company to enter the employ of the Northwestern States Portland Cement Co., Mason City, Iowa, where he had charge of the installation of a waste heat plant.

Mr. Price brings to the American Oil Corporation a world of experience in his special department, as he is thoroughly familiar with the cement industry, and the lubrication problems which daily confront it.

Quarried from Life

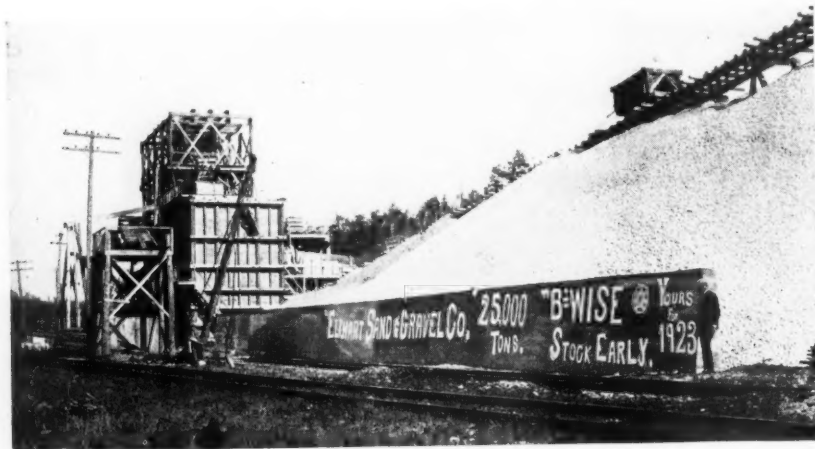
By Liman Sandrock

"Put It on the Fence"

WE AMERICANS are certainly travelers. We may have developed this trait because we have the finest railroads in the world, or, more likely, because,

"Our Oldest Employee"

ONE of the proud boasts of the long-time plant operator is, "our oldest employee." Occasionally, ROCK PRODUCTS will endeavor to give brief sketches of these honored



The Elkhart Sand and Gravel Co. uses its fence to advertise its wares—and incidentally, offer good advice

having the desire to reach out and see what the other fellow is accomplishing. the railroads have, of necessity, been compelled to meet our requirements in getting to Somewhere to see Something. In the middle west vernacular, we just must "get to go."

And when we are seated and started on our way, we begin gazing out the window to learn "who's who" in the passing scenery. Every industry, every commercial industry, has its label, its tag. We look for it instinctively.

Probably some such thoughts were in the minds of the Elkhart Sand and Gravel Co., at Elkhart Lake, Wis., when they decided to utilize the board fence enclosing their plant at that place for advertising purposes.

Accompanying this little story is an illustration showing how they "put it on the fence." Following the company name are the words in huge lettering—"25,000 Tons. B-Wise. Stock Early. Yours for 1923."

Towering over this fence is a huge stockpile of gravel, doubtless containing the aforesaid 25,000 tons. Here is a veritable "sermon in stones"—and the text is on the fence. It should be live enough to keep its flying congregation awake.

What are you doing with your fence?

workers in the industry. To start with, we have abstracted an article from the *Warner-American News* concerning Capt. Elwood F. Wilkins, superintendent of the Manor



Capt. Elwood F. Wilkins

sand and gravel plant of that company:

"One of the oldest employes of the Charles Warner Co. (of course we mean in point of service) is Capt. Elwood F. Wilkins of the sand and gravel department.

"When the company first went in the sand dredging business a small dredge named 'Alva' was purchased from the old National Dredging Co., of Wilmington, and in charge of the 'Alva' was Captain Wilkins. This was on November 1, 1892. Captain Wilkins remained as captain of the 'Alva' until 1897 when she was accidentally burned to the water's edge.

"When Captain Wilkins first came with the Warner Co., the sand and gravel department consisted of one small dredge, three 200-ton sand barges and two or three small schooners. Today this department operates three large dredges, five tugs and over 50 sand barges of from 450 to 650 tons capacity. It also operates an elaborate land plant at Tullytown (Manor plant), of which Captain Wilkins is now superintendent.

"During all these years Captain Wilkins has in many ways proved his loyalty and fidelity to the company's interest. Incidentally, Captain Wilkins tells us that in all the 30 years of his association with the company he has never lost a single day's pay."

They Said It

THE START of a perfect day: Manager Walter S. Holmes, of the Chickamauga Quarry and Construction Co., tells us that "the car situation is gradually getting better. We started night work again last week. Have 32 empties at our quarry this beautiful Monday morning, so we are able to appreciate the wonderful weather we are having."

THE CHICAGO *Tribune* says that "Lloyd George urges stern front to Turk." Is this a variation of the thumb-to-the-nose invitation of our boyhood days?

SAYS the Honorable Secretary McPherson of the British Institution of Quarry Managers: "Some of us would be delighted to cross the herring-pond to attend the first conference of the Institution of Quarry Managers of America." On another page ROCK PRODUCTS asks: "Why not an American Quarry Institute or Association?" Well, this page is not one whit behind its more serious sisters, so we, too, say "Why not?"

SOME ELECTION! Golly, how the R's and the D's popped up in the returns columns last week. The R's didn't give a rip for the D's and the D's didn't give a damn for the R's. Did your crowd win? Sure, and so did ours.

IN NORTHERN GERMANY a ton of cement costs 125,724 marks on the hoof. In Russian roubles a ton would cost—well, we haven't the space in which to express it.

Editorial Comment

Recent financial statements of the Chicago packing-house industries say that at last the fertilizer branches of the business are beginning to show a profit. This is a hopeful sign for **Agriculture Picking Up** agricultural lime, limestone, and rock phosphate producers. Limestone has pretty well held its own during the last two or three years of pinched buying on the part of the farmer, probably because under ordinary conditions in the Mid-West it is the cheapest kind of fertilizer. Producers of all three commodities have the satisfaction of knowing that while the farmer may postpone buying these necessities for the time-being, his land goes on getting hungrier for them every season, and in the end will demand just so much more to bring it back to health.

Because a system of membership dues based on tonnage assessments has worked out remarkably well in the portland cement industry and some others, every trade association in the rock products field seems to have considered no other form of raising budget requirements. Where it is expected to use the association solely for promotional work to extend the use of a standardized product such as portland cement it probably can be safely assumed that each member profits according to his production, or sales. But in the case of ordinary association work, such as meeting once a year and developing contacts with government officials, other trade and professional associations, etc.—that is attempting to advance knowledge of the industry and its products—it does not seem that a tonnage system of dues is any more appropriate than equal individual membership dues.

Besides the model of the Portland Cement Association we have many other associations such as the American Concrete Institute, the American Institute of Mining Engineers, etc., etc., which are "professional" associations rather than "trade" associations, but which nevertheless accomplish a vast amount of good for their membership, who belong as individuals and all pay the same dues. The good such associations accomplish is directly proportional to the individual effort and interest put into it by every member. They cannot depend wholly on the efforts of a staff of association employees. Members must therefore be individuals with personalities and not mere corporations.

It is questionable, at least, if producing sand and gravel, crushed stone or slag, operating a crushing plant, etc., is not as much a part of the profession of engineering as it is a trade in a commodity. Consequently, perhaps as much, or more, can be gained by

organization along the lines of an engineering society as along the lines of a trade association, at least until enough engineering has been done in these industries to establish a more or less standardized commodity that can be promoted or merchandized by broadcast methods.

Complaints of labor shortage in quarries continue to come from readers in the East and Middle West. If the situation is serious now, what will it be another spring when construction work is again in full swing and other industries are recovering the prosperity that is promised from all sides?

Make It Specific!

It is indeed high time for operators to take action, and the coming January convention of the industry offers an exceptional opportunity for concerted action. For that reason alone a trip to Chicago is worth the while of every man whose interests lie wholly or partly in the production of quarry products.

But the great trouble with concerted action by conventions or assemblies is that such action usually takes the form of a mere resolution stating grievances in general terms. In this case, however, there is an opportunity for a resolution worded in the form of a specific request than can be acted upon directly by Congress and the President.

According to a dispatch from Rome, November 19, through its foreign news service to the *Chicago Tribune*:

The new Mussolini government will co-operate with America in carefully selecting a type of immigrants for the Italian quota that will correspond with America's needs.

"If the United States wants farm workers, laborers, housemaids, college professors, or movie actors, we will sort them out and send exactly what is wanted—we have no desire to send immigrants who are not needed and not wanted in the American industrial machine," Immigration Commissioner Giuseppe de Michelis told the *Tribune*.

Signor de Michelis had just returned from a tour of the United States and Canada, during which he visited Chicago. He said Canada offered a field for intensive population and Italy intended to co-operate with the government in sending a selected type of agriculturalists.

"I can give them 6,000,000 or 7,000,000, if they want them," he said.

The *Tribune* of November 11 contained an Associated Press dispatch from Rome stating: "The new Italian government plans to ask the United States government to increase the annual quota of Italian emigrants allowed to enter the United States from 42,000 to 100,000. The proposal will be based upon 'the great qualities of the Italian workers, especially in agricultural pursuits.'"

Now every quarry man knows that agricultural Italians are good quarry laborers. So here is the opportunity to ask the government a specific thing—to co-operate with the Italian government in supplying a very much needed class of immigrants, a class upon which the prosperity of many great industries depends.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	1.10
Buffalo, N. Y.	1.00	1.30 per net ton all sizes	1.25	1.25	1.25	1.25
Chaumont, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25
Cobleskill, N. Y.	1.35	1.35	1.35	1.35	1.35	1.35
Coldwater, N. Y.	1.35	1.35	1.35	1.35	1.35	1.35
Eastern Penna.	.75	1.15	1.15	1.15	1.00	1.00
Munns, N. Y.	.75	1.25	1.25	1.25	1.25	1.25
Prospect, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Walford, Pa.	.75	1.20	1.20	1.20	1.20	1.20
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL:						
Alton, Ill.	1.50	1.50	1.50	1.50	1.50	1.50
Buffalo, Iowa	.90	1.20	1.20	1.20	1.05	1.05
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	1.20
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	1.30
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.	1.00@1.25	1.10	1.00	.90	.90	.90
Greencastle, Ind.	1.00	1.50	1.50	1.50	1.50	1.50
Kansas City, Mo.	1.20	1.20	1.35	1.20	1.20	1.20
Krause, Columbia and Val-	.65	.80	.80	.85	.85	.85
meyer, Ill.	.80	.80	.80	.80	.80	.80
Lannon, Wis.	.80	1.35	1.05	.95	.90	.90
Mitchell, Ind.	1.50	1.60	1.55	1.45	1.40	1.40
Montreal, Canada	1.00	1.10	1.10	1.10	1.10	1.10
Monroe, La.	1.10	1.10	1.10	1.10	1.10	1.10
River Rouge, Mich.	1.35	1.30	1.25	1.25	1.25	1.25
Sheboygan, Wis.	1.30	1.35	1.35	1.35	1.35	1.35
Southern Illinois	.75	1.40	1.30	1.25	1.25	1.25
Stollie, Ill. (I. C. R. R.)	1.60	1.70	1.70	1.70	1.60	1.60
Stone City, Iowa	1.90	2.25	2.25	2.25	2.00	2.00
Toledo, Ohio	1.90	2.25	2.25	2.25	2.00	2.00
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Prices include 90c freight All sizes 1.00 per ton						
WESTERN:						
Waukesha, Wis.	.75	1.25	1.40	1.25	1.15	1.15
Alderson, W. Va.	.75	2.00	2.00	1.40	1.40	1.40
Bromide, Okla.	.85@1.00	.85@1.00	.85@1.00	.85@1.00	.85@1.00	.85@1.00
Cartersville, Ga.	1.00	1.00	1.00	1.00	1.00	1.00
Chickamauga, Tenn.	1.00	1.00	1.00	1.00	1.00	1.00
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	.50	1.15	1.40	1.25	1.15	1.15
Et. Springs, W. Va.	.50	1.60	1.60	1.45	1.45	1.45
Garnet and Tulsa, Okla.	1.00	1.40	1.40	1.40	1.40	1.40
Ladd, Ga.	1.00	1.40	1.35	1.30	1.25	1.20
Morris Spur (near Dallas) Tex.	.50	1.80	1.80	1.80	1.80	1.80
Atchison, Kans.	.20	1.65	1.65	1.55	1.45	1.40
Blue Springs and Wymore, Neb.	.50	1.50	1.50	1.50	1.25	1.25
Cape Girardeau, Mo.	1.00	1.50	1.50	1.50	1.50	1.40
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	1.50
Branford, Conn.	.60	1.50	1.25	1.15	.95	.95
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	1.40
Dresser, Ind.	1.00	2.25	1.75	1.75	2.00	2.00
Duluth, Minn.	.90@1.00	2.00@2.25	1.75@2.00	1.40@1.50	1.30@1.40	1.50
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	1.40
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.15	1.50	1.45	1.35	1.30	1.30
New Britain, Middlefield, Rocky	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	1.00
Hill, Meriden, Conn.	1.75	1.75	1.75	1.75	1.75	1.75
Oakland, Calif.	.50*	1.35	1.50*	1.50*	1.50*	1.50*
Richmond, Calif.	.70	1.35	1.50	1.40	1.35	1.35
Spring Valley, Calif.	2.10	2.10	2.00	1.75	1.60	1.60
Springfield, N. J.	.60	1.35	1.25	1.10	1.00	1.00
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	1.00

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	1.20	1.00	1.00	1.05	1.10
Berlin, Utley and Red	1.50	1.60	1.40	1.30	1.30	1.30
Granite, Wis.	1.00	1.35	1.35	1.25	1.00	1.10
Columbia, S. C.—Granite	.85	1.55	1.55	1.40	1.35	1.30
Dundas, Ont.—Limestone	1.20	1.30	1.20	1.20	1.20	1.20
Eastern Penna.—Sandstone	1.00	2.00	2.00	1.35	1.35	1.35
Eastern Penna.—Quartzite	1.35	1.40	1.30	1.20	1.20	1.20
Lithonia, Ga.—Granite	2.50@3.50	2.00@2.25	2.00@2.25	2.00@2.25	1.25@1.55	1.50
Lohrville, Wis.—Cr. Granite	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Middlebrook, Mo.—Granite	1.00	1.60	1.55	1.50	1.50	1.50
San Diego, Calif.	1.00	1.60	1.55	1.50	1.50	1.50
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	1.50	1.50	1.50

*Cubic yard. †Agr. lime. ‡R. R. ballast. §Flux. ¶Rip-rap, a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% CaCO ₃ , 1.14% MgCO ₃ — Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa. — Analysis, 97% CaCO ₃ — 100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk	3.00
Hillsville, Pa. — Analysis, 96.25% CaCO ₃ ; 75% thru 100 mesh; bulk	4.50
Jamesville, N. Y. — Analysis, 89.25% CaCO ₃ ; 5.25% MgCO ₃ ; 95% thru 50 mesh; bags, 4.00; bulk	2.50
New Castle, Pa. — 89% CaCO ₃ , 1.4% MgCO ₃ — 75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk	3.00
Walford, Pa. — Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
West Stockbridge, Mass., Danbury, Conn., North Pownall, Vt. — Analysis, 90% CaCO ₃ — 50% thru 100 mesh; paper bags, 4.25 — cloth, 4.75; bulk	3.00

CENTRAL:

Alton, Ill. — Analysis, 97% CaCO ₃ , 0.1% MgCO ₃ — 90% thru 100 mesh, 50% thru 50 mesh	6.00 4.00
Bedford, Ind. — Analysis, 98.5% CaCO ₃ , .5% MgCO ₃ — 90% thru 10 mesh	1.50
Belleville, Ont. — Analysis, 90.9% CaCO ₃ , 1.15% MgCO ₃ — 45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Bellevue, Ohio — Analysis, 61.56% CaCO ₃ , 36.24% MgCO ₃ ; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Ia., and Moline, Ill. — 97% CaCO ₃ , 2% MgCO ₃ — 50% thru 100 mesh; 50% thru 4 mesh	1.25 1.00
Buffalo, Ia. — 90% thru 4 mesh	1.00
Cape Girardeau, Mo. — Analysis, 93% CaCO ₃ , 3.3% MgCO ₃ — 50% thru 100 mesh	1.50 1.35
90% thru 4 mesh, cu. yd.	1.35
Chasco, Ill. — Analysis 96.12% CaCO ₃ , 2.5% MgCO ₃ ; 90% thru 100 mesh, 90% thru 50 mesh	5.00 1.35
Chicago, Ill. — Analysis, 53.63% CaCO ₃ , 37.51% MgCO ₃ — 90% thru 4 mesh	1.00
Columbia, Ill., near East St. Louis — ¼-in. down	1.25@1.80
Detroit, Mich. — Analysis, 88% CaCO ₃ , 7% MgCO ₃ — 75% thru 200 mesh, 2.50@4.75 — 60% thru 100 mesh	1.80@3.80
Elmhurst, Ill. — Analysis, 35.73% CaCO ₃ , 20.69% MgCO ₃ — 50% thru 50 mesh	1.25
Greencastle, Ind. — Analysis, 98% CaCO ₃ — 50% thru 50 mesh	2.00
Kansas City, Mo. — 50% thru 100 mesh	1.50
Krause and Columbia, Ill. — Analysis, 90% CaCO ₃ , 90% thru 4 mesh	1.20
Lannon, Wis. — Analysis, 54% CaCO ₃ , 44% MgCO ₃ — 90% thru 50 mesh	2.00
Marblehead, Ohio — Analysis, 83.54% CaCO ₃ , 14.92% MgCO ₃ ; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; sacks	4.50 3.00
Milltown, Ind. — Analysis, 94.41% CaCO ₃ , 2.95% MgCO ₃ — 33.6% thru 100 mesh, 40% thru 50 mesh	1.25@1.65
Mitchell, Ind. — Analysis, 97.65% CaCO ₃ , 1.76% MgCO ₃ , pulverized limestone	1.50
Montrose, Ia. — 90% thru 100 mesh	1.25
Narbo, Ohio — Analysis 56% CaCO ₃ , 43% MgCO ₃ , limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh	1.50@2.00
Ohio (different points), 20% thru 100 mesh; bulk	1.25@1.50
Piqua, O. — 90% thru 100	3.25@5.00
40% thru 100	1.75@2.00
100% thru 4	1.25
River Rouge, Mich. — Analysis, 54% CaCO ₃ , 40% MgCO ₃ ; bulk	.80@1.40
Stollie, Ill., near East St. Louis on I. C. R. R. — Thru ¼-in. mesh	1.30
Stone City, Ia. — Analysis, 98% CaCO ₃ 50% thru 50 mesh	.75

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Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio— $\frac{1}{4}$ -in. to dust, 20% thru 100 mesh	1.30
Yellow Springs, Ohio—Analysis 96.08% CaCO_3 , 90% thru 50 mesh	
CaCO ₃ , 93% MgCO_3 , 32% thru 100 mesh; 95.57% CaCO_3 , 6.00% bulk	4.25
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75

SOUTHERN:

Alderson, W. Virginia—Analysis 90% CaCO_3 ; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% CaCO_3 , 3.5% MgCO_3 —50% thru 100 mesh	2.00
90% thru 4 mesh	1.50
Cartersville, Ga.—Analysis, 54% CaCO_3 , 41% MgCO_3 —all passing 10 mesh	2.00
Claremont, Va.—Analysis, 92% CaCO_3 , 2% MgCO_3 —90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% CaCO_3 —90% thru 50 mesh	1.75
Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk	3.00
Knoxville, Tenn.—80% thru 200 mesh—80% thru 100 mesh	3.50
(Bags extra 1.25 per ton)	2.70
Ladd, Ga.—50% thru 50 mesh	2.00
Linnville Falls, N. C.—Analysis, 53% CaCO_3 ; 42% MgCO_3 —50% thru 100 mesh; 2.50 per ton bulk, 3.50 per ton mesh 200-lb. bulk; crushed limestone, $\frac{3}{4}$ down including dust, 1.00; 1 to $\frac{3}{4}$, 1.60; 2-in. and less	1.40
Mountville, Va.—Analysis, 76.60% CaCO_3 , 22.83% MgCO_3 —50% thru 100 mesh; 50% thru 20 mesh; sacks	5.00

WESTERN:

Colton, Calif.—Analysis, 95% CaCO_3 , 2.4% MgCO_3 —all thru 14 mesh—bulk	4.00
Garnett, Okla.—Analysis, 80% CaCO_3 , 3% MgCO_3 ; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Sidg—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md.	2.25
Berkley Springs, W. Va.	2.00@2.25
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	5.00@10.00
Columbus, Ohio	2.00@2.50
Dunbar, Pa.	2.25
Falls Creek, Pa.	2.50
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@2.50
Mapleton, Pa.—Damp, 2.00; dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind.	.50@.55
Mineral Ridge, Ohio	2.50@2.75
Green	2.00
Montoursville, Pa.	1.75
Oregon, Ill.	1.25@2.00
Ottawa, Ill.	2.50
Pittsburgh, Pa.—Dry, 4.00; damp	4.00
Rockwood, Mich.	2.50
Round Top, Md.—Damp, 1.50; dry	2.00
Sands, Pa.	2.50
San Francisco, Cal.	3.00@3.50
St. Mary's, Pa.	2.25
Thayers, Pa.	2.00
Utica, Ill.	1.25@1.50
Zanesville, Ohio	2.00@2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast	3.75
Molding fine and brass molding	2.00
Molding coarse	1.75
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenville and Greenville, Ill.—Molding fine	1.50@1.60
Molding coarse	1.50@1.75
Brass molding	2.00
Beach City, O.—Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse	5.00
Sand blast	5.00@6.00
Stone sawing	1.50@2.00
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, Ohio—Core	1.50@2.00
Sand blast	3.50@5.00
Furnace lining	2.50@3.00
Molding fine	2.00@2.50
Molding coarse	1.75@2.00
Traction	.75@.90
Brass molding	2.00@3.00

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Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95			.85	
Eric, Pa.	.48	.48	.90	1.20	1.20	
Farmingdale, N. J.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.15	.70	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C. (re washed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50					.90
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.	1.75@2.25	1.75@2.45				
Cincinnati, Ohio	.70	.65		.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.60	.60	1.70	1.70	1.70	1.70
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Farlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.45	.45	1.25			.90
Elkhart Lake, Wis.	.50	.40	.60	.50	.50	.50
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			1.60	
Hawarden, Ia.		.40		.60	.60	
Hersey, Mich.				1.50	.75@1.00	.75@1.00
Indianapolis, Ind.	.60	.60		.65@.75		
Janesville, Wis.	.65@.75	.50		.70		
Libertyville, Ill.		.40	.40		1.25	
Mankato, Minn.—Pit run	.50	.65	1.80	1.80	1.70	1.65
Mason City, Ia.	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05
Mendota, Ill.	1.06	1.06	1.25	1.26	1.26	1.25
Milwaukee, Wis.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Minneapolis, Minn.	.60@.90	.60@.90	1.20@1.50	1.20@1.50	1.20@1.50	1.20@1.50
Moline, Ill.		.60			.80	
Riton, Wis.		1.45			1.40	1.40
St. Louis, Mo., f.o.b. cars	2.05	2.20	2.35	2.15		2.10
St. Louis, Mo., delivered on job	.65@.75	.60@.75	.60@.75	.60@.75	.60@.75	.60@.75
Summit Grove, Clinton, Ind.	1.00	1.00	1.25	1.25	1.00	1.00
Terre Haute, Ind.	.40	.40	.80	.80	.80	.80
Waukesha, Wis.	.40	.40	1.25	1.25	1.10	1.10
Winona, Minn.						
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@.70		.60@.80	.50@.70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala.	1.48			all gravel—1.88		
Charleston, W. Va.	1.40		1.50			
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.	2.00@2.25	2.00@2.25	2.00	2.00	2.00	2.00
Jackson's Lake, Ala.	.50@.60	.50@.60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75	.75	1.25	1.25	1.25	1.00
Lake Weir, Fla.		.60				
Macon, Ga.	.50@.75					
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.00	1.00	1.20			.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90				
Roseland, La.	.50					
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)			1.25		1.10
Los Angeles, Calif.		.70			1.50	
Pueblo, Colo.	1.10	.90				
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.15@1.45
San Francisco, Calif.	1.00	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	.85*	.85*	1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, 1/4 inch	Gravel, 1/2 inch	Gravel, 1 inch	Gravel, 1 1/2 inch	Gravel, 2 inch
Boonville, N. Y.	.60@.80		.55@.75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd. .80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			.85
Estill Springs, Tenn.				.50@.65		.50
Fishers, N. Y.		.50@.65				
Grand Rapids, Mich.						
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.	1.00*				.50	
Hersey, Mich.						
Indianapolis, Ind.			Mixed gravel for concrete work, .65			.55
Lindsay, Tex.	.85@1.00				.65@.75	
Janesville, Wis.		.65				
Pine Bluff, Ark.			Road gravel .50		.50@.65	.50@.65
Rochester, N. Y.	.60@.75	.60@.75				
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.	.50	.50	60% gravel, 40% sand, 1.55		.50	.50
Summit Grove, Ind.		.80			1.50	1.30
Waco, Tex.						
Winona, Minn.			Clean pit run .60 (crushed rock sand)			
York, Pa.		.95@1.10				

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	1/4 inch down	1/2 inch and less	3/4 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.15
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.		All sizes, 1.50, F. O. B. Chicago					
Detroit, Mich.		All sizes, 1.65, F. O. B. Detroit					
Ironton, O.	2.05	1.45	1.75	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
(Any delivery in city except team track deliveries)							
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk. Bags	Lump Lime Blk. Bbl.
EASTERN:						
Adams, Mass.			7.00			2.90
Bellefontaine, Pa.			8.00	9.00	8.00	8.50
Berkley, R. I.			12.00			2.30
Buffalo, N. Y.	11.50	10.00	10.00	12.00	8.00 10.00	8.50 1.60
Chaumont, N. Y.					2.50 4.00	
Lime Ridge, Pa.						5.00
West Rutland, Vt.	13.50	12.00	7.50	13.50		10.00
West Stockbridge, Mass.						2.25
Williamsport, Pa.			10.00		10.00	6.00
York, Pa. (dealers' prices)		11.50	10.50	11.50		7.50 1.65*
Zylonite, Mass.	3.20d	2.90d	7.00			
CENTRAL:						
Delaware, Ohio	11.50	10.00	9.50	10.50		9.00 1.60
Gibsonburg, Ohio	11.50	10.00	10.00		8.00 10.00	8.50 1.60
Huntington, Ind.	11.50	10.00	10.00			8.00 1.70*
Luckey, Ohio	11.50	10.00	10.00		8.00 10.00	8.50 1.60
Marblehead, Ohio	11.50	10.00	10.00			
Marion, Ohio		10.00	10.00			
Mitchell, Ind.		12.00	12.00	12.00	11.00	10.00 1.60
Sheboygan, Wis.						7.50d
White Rock, Ohio	11.50	10.00	10.00	11.00	8.00 10.00	8.50 1.60
Woodville, O. (dlrs.' price)	11.50a	10.00a	10.00a	11.00a		9.00 1.60
SOUTHERN:						
Erin, Tenn.						6.00 1.00
Karo, Va.						7.00 1.30
Knoxville, Tenn.	11.50@18.00	11.00	11.00	11.00	10.00 11.00	8.50 1.50
Ocala and Zuber, Fla.	12.00	11.50	11.50	14.00		12.00 1.60
Sherwood, Tenn.	12.00	11.00				8.50 1.50
Staunton, Va.					7.00 8.00	7.50b 1.40
WESTERN:						
Colton, Calif.			15.00			19.70
Kirtland, N. Mex.						15.00
San Francisco, Calif.	22.00	22.00	15.00	22.00		16.00 2.15*
Tehachapi, Calif.						13.00 2.00

*100-lb. sacks; *180-lb. net, price per barrel; *180-lb. net, non-returnable metal barrel; \$Paper sacks.
 (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction, damp	2.25
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00@1.25
Sand blast	3.25@3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.30@1.50
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay only	.60@.80
Kansas City, Mo.—Missouri River core	.70
Kasota, Minn.—Stone sawing	.80
	1.30@1.50

Klondike, Pacific, Gray Summit, Mo.—Glass sand, furnace lining, molding coarse

Molding fine	2.00@2.50
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry	2.75
Massillon, O.—Traction, molding fine and coarse, furnace lining, core	2.75
Michigan City, Ind.—Core, traction	.40@.45
Mineral Ridge, Ohio—(Green) core	2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.25
Traction	1.00
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.50
Oregon, Ill.—Core, furnace lining	1.25@2.00
Sand blast	3.00@4.50
Stone sawing	1.50@3.50
Brass molding	1.25@2.00
Ottawa, Ill.—Core, furnace lining, molding, steel, traction, roofing sand	2.00
Brass molding	3.00
Sand blast	3.50
Stone sawing	.75@1.00
Ottawa, Minn.—All crude silica sand	
Pelzer, S. C.—Glass sand (carload lots)	
Rockwood, Mich.—Core, damp	1.90
Roofing	2.75
Sand blast	3.75

Miscellaneous Sands

(Continued)

Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit	
Furnace lining, molding coarse, sand blast	
Stone sawing traction	3.60
Thayers, Pa.—Core	1.75@2.00
Furnace lining	1.25
Molding fine and coarse	1.25
Traction	2.00
Utica, Ill.—Core	.90
Furnace lining	1.00
Molding fine	.75
Molding coarse	.90
Stone sawing	1.00
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Brass molding and molding fine	1.50@1.75
Molding coarse	1.25@1.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	14.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga., and Marshall, N. C.—Crude talc	4.00@4.50
Ground talc (20-50 mesh), bulk 6.50, bags	7.50
Ground talc (150-200 mesh), bulk 7.50@9.50, bags	8.50@12.50
Chester, Vt.—Crude talc	5.00
Ground talc (150-200 mesh), bulk, bags	7.00@9.00
Emeryville, N. Y.—200-325 mesh; bags	8.00@10.00
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Halesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@3.50
Ground talc (20-50 mesh)	6.75@7.75
(150-200 mesh) bags	9.00@14.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.50, bags	5.50
(150-200 mesh); bulk 6.50, bags	7.50
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 65%-70%	4.00@5.50
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72%	
B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, 70%	
B.P.L. (2000 lbs.)	6.50
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho—2,000 lb. mine run, B.P.L. 70%	4.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	\$10.20	\$8.40	\$8.10	\$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x14	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x9	12.60	8.70	8.40	7.80
16x8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x8	11.10	8.40	8.10	7.50
14x7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	\$ 8.10	\$8.10	\$7.20	\$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock	
Wales, Tenn.—B.P.L. 70%.....	7.75
Per 2000-lb. Ton	
Barton, Fla.—Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L. 65%.....	6.00
B.P.L. 75% (brown rock).....	12.00
Columbia, Tenn.—B.P.L. 68% to 72% B.P.L. 65% (90% thru 200 mesh) bulk.....	5.50
Morrison, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65%.....	5.50@6.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton	
Bartow and Norwills, Fla.—B.P.L.	
50% bulk.....	6.00@ 8.00
B.P.L. 78% bulk.....	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.).....	3.25
70% (min.).....	3.50
Jacksonville (Fla.) District.....	10.00@12.00
Ground Land Pebble	
Jacksonville (Fla.) District.....	14.00
Add 2.50 for sacks.....	
Lakeland, Fla.—B.P.L. 60%.....	6.00
Morristown, Fla.—26% phos. acid.....	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.		
City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries.....		17.50
Deerfield, Md.—Green; bulk.....	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble.....	16.00@20.00	10.00@14.00
Slate granules.....		7.00@8.00
Granville, N. Y.—Red slate granules.....		7.50
Ingomar, Ohio.....	10.00@12.00	10.00@25.00
Lincoln, Neb.—Red, white, grey, in bags.....		30.00
granite; sacks.....	28.50@30.00	20.00@22.50
Marble chips, white, pink, creole, black.....		27.50
green sparklets.....		37.50
(bags extra).....		50.00
Milwaukee, Wis.....	20.00@30.00	

New York, N. Y.—Red and yellow Verona.....	
Middlebrook, Mo.—Red Phillips'g, N. J.—Green stucco dash.....	16.00@20.00
Piqua, O.—Marble.....	14.00@18.00
Poultney, Vt.—Roofing granules.....	7.00@ 9.00
Red Granite, Wis.....	7.50
Sioux Falls, S. D.....	7.50
Tuckahoe, N. Y.....	12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 10c extra.....	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.		
	Common	Face
Appleton, Minn.....	20.00	25.00@35.00
Bellows Falls, Vt.....	18.00	25.00@35.00
Birmingham, Ala.....	15.00	30.00@40.00
Carpenterville, N. J.....	20.00	36.00
Easton, Pa.....	16.00	40.00@60.00
Eugene, Ore.....	25.00@26.00	50.00@75.00
Friesland, Wis.....	20.00	33.00
Houston, Tex.....	16.00	19.50
Lockport, N. Y.....	18.00	30.00@40.00
Omaha, Neb.....	18.00	30.00@ 25.00
Piqua, O.....	15.00	30.00@60.00
Portland, Ore. (Del'd).....	21.00	30.00@75.00
Puyallup, Wash.....	20.00	30.00@75.00
Rapid City, S. D.....	18.00	25.00@40.00
Rochester, N. Y.....	21.00	
St. Paul, Minn.....	15.00	30.00@35.00
Salem, Ore.....	25.00	35.00@50.00
Salt Lake City, Utah.....	17.00@18.00	35.00@40.00
Seattle, Wash.....	22.00	35.00@80.00
Springfield, Ill.....	18.00	20.00@25.00
Tampa, Fla.....	15.00	25.00@65.00
Wauwatosa, Wis.....	14.00@15.00	33.00@75.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.	
Albany, Ga.....	7.00
Barton, Wis.....	10.50
Boston, Mass.....	13.00@14.00
Brighton, N. Y.....	14.75
Buffalo, N. Y.....	16.50
Dayton, Ohio.....	12.50@13.50
El Paso, Texas.....	13.00
Grand Rapids, Mich.....	12.00
Lancaster, N. Y.....	13.25
Michigan City, Ind.....	11.00
Milwaukee, Wis.....	14.00
Minneapolis, Minn.....	14.00
Plant City, Fla.....	10.00
Portage, Wis.....	15.00

Redfield, Mass.....	15.00
Rives Junction, Mich.....	11.00
Saginaw, Mich.....	11.00
San Antonio, Texas—Common.....	15.00
South Dayton, Ohio.....	12.50@13.50
Syracuse, N. Y. (delivered at job).....	18.00
f.o.b. cars.....	14.00
Washington, D. C.....	14.50
Winnipeg, Can.....	18.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finishing	Common
Atlanta, Ga.....	23.00	13.00
Baltimore, Md.....	21.00	15.75
Cincinnati, Ohio.....	14.80	12.30
Chicago, Ill.....	20.00	18.00
Dallas, Tex.....	25.00	
Denver, Colo.....	24.00	
Detroit, Mich.....	18.00	13.25
Kansas City, Mo.....	25.60	24.00
Minneapolis, Minn. (white).....	25.50	22.00
Montreal, Que.....	21.00	21.00
New Orleans, La.....	17.25	17.25
New York, N. Y.....	16.80	13.10
Philadelphia, Pa.....	15.50	14.50
St. Louis, Mo.....	21.20	19.00
San Francisco, Calif.....	22.00	16.00
Seattle, Wash. (paper sacks).....	24.00	

Lump per 180-lb. Barrel (net)

	Finishing	
	Common	
Atlanta, Ga.....	2.25†	1.85†
Baltimore, Md.....		15.00†
Cincinnati, Ohio.....		10.75†
Chicago, Ill.....	1.50†	1.40†
Dallas, Tex.....	15.00†	11.00†
Denver, Colo.....		2.70†
Detroit, Mich.....		17.00†
Kansas City, Mo.....	2.34†	2.20†
Minneapolis, Minn.....	1.70†	1.40†
Montreal, Que.....	15.00†	11.00†
New Orleans, La.....	3.63½*	2.75@3.13½*
New York, N. Y.....	13.00†	12.00†
Philadelphia, Pa.....		17.75†
St. Louis, Mo.....		1.75†
San Francisco, Calif.....	2.80†	
Seattle, Wash.....		

*Per 280 lb. bbl. (net). †Per 180-lb. bbl. (net). ‡Per ton. Refund of 10c per bbl. Minneapolis quotes brown common lump lime: Kelly Island white is \$1.55, Sheboygan \$1.45. New York quotes hydrated lime "on cars" in paper sacks; lump lime "alongside dealers' docks" or "on cars."

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga.....	2.80
Boston, Mass.....	3.03
Cedar Rapids, Iowa.....	2.45
Cincinnati, Ohio.....	2.51
Cleveland, Ohio.....	2.46
Chicago, Ill.....	2.20
Dallas, Tex.....	2.25
Davenport, Iowa.....	2.43
Denver, Colo.....	2.65
Detroit, Mich.....	2.47
Duluth, Minn.....	2.14
Indianapolis, Ind.....	2.41
Kansas City, Mo.....	2.45
Los Angeles, Calif.....	3.06
Milwaukee, Wis.....	2.37
Minneapolis, Minn.....	2.39
Montreal, Can. (sacks 20c extra).....	2.40
New Orleans, La.....	2.83
New York, N. Y.....	2.70
Pittsburgh, Pa.....	2.24
Portland, Ore.....	3.05
St. Louis, Mo.....	2.35
San Francisco, Calif.....	2.63
St. Paul, Minn.....	2.39
Toledo, Ohio.....	2.48
Seattle, Wash.....	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Ground Rock Gypsum		Agri-cultural Gypsum		Stucco* and Calced Gypsum		Cement†		Wood Fiber		White‡ Gauging		Sanded Plaster		Keene's Cement		Trowel Finish		Plaster Board—		Wallboard, 6'-10", 180 lb. Per M	
	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.	Weight 1500 lb. Per M Sq. Ft.	Weight 1850 lb. Per M Sq. Ft.
Douglas, Ariz.....																						
Fort Dodge, Iowa.....	3.00	3.50	6.00	8.00	10.00	10.50	20.00	21.30	20.00						31.25	21.00	19.38	20.00			30.00	
Garbutt, N. Y.....			6.00	8.00	10.00	10.00							7.00					20.00				
Grand Rapids, Mich.....	3.00		6.00	8.00	10.00	10.00															30.00	
Hanover, Mont.....	4.50		6.00	10.00		10.50																
Hound House, Nev.....		8.50	6.50	10.50@11.50																		
Oakfield, N. Y.....	3.00	4.00	6.00	8.00	10.00	10.00	20.20	30.75	21.00				7.00+		30.75	21.00	19.375	20.00			30.00	
Rapid City, S. D.....	4.00		10.00	12.00	12.50										33.75							
Winnipeg, Man.....	5.50	5.50	7.00	13.50	15.00												28.50					35.00

NOTE—Returnable Jute Bags, 15c each, \$3.00 per ton; Paper Bags, \$1.00 per ton extra. *Shipment in bulk 25c per ton less; †Bond plaster \$1.50 per ton additional; ‡Sanded Wood Fiber \$2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

Accident Prevention

"Safety First"

UNDER the above title, President George B. Wood of the Rockland and Rockport Lime Corp., addressed the following eloquent plea for the safety of the worker in the quarries of this Eastern company. When it is recalled that its quarries are almost "chasms" in the bosom of Mother Earth—sometimes reaching to a depth of 400 ft.—the chances for accident by carelessness alone must be met by the efforts of all concerned in the operation of these quarries.

President Wood, in this appeal, published in the company's Bulletin for November 2, has exemplified the red letters at the head of the Bulletin, "One man's efforts toward safety may seem small, but altogether we can do a great deal."

"A LETTER TO ALL MY FELLOW WORKERS:

"We all together make one single organization, each of us as necessary as the other to the successful working of the whole. A kiln tender cannot work unless a quarryman breaks the rock, a quarryman must stop if the kiln tender plugs his kilns; each needs the general manager to market the lime to furnish money for the pay envelopes. And the general manager needs them both if he will successfully operate the property entrusted to him by its owners.

"Who can say which is the most important leg of a chair? Take away any one and the whole thing collapses. Who can say which is the most important wheel in a watch? Take away even the smallest and the whole works stop. Each of us must keep in trim if the whole machine is expected to run.

"Accidents to men are worse than accidents to machinery. Both can usually be restored to working order, but it is often times only the machine which can be rebuilt as good as new. The cost in dollars does not stop with the doctors' bills and lost wages to the man; other members of his family may be obliged to stop work and nurse him, and the cost to other members of his family may mean years of life which might have been lived with more health and happiness. The cost in dollars to the employer does not stop with the amount of compensation wages and doctors' bills. It costs much money to break new men into work of the experienced who have been injured. One green man's mistakes may spoil the efforts of five other men who formerly made an efficient team. Inexperienced

men are often the cause of broken down machinery, and when men stand idle waiting for machinery to start, the owner pays the bill. Much of such unnecessary costs often results in all the difference between a loss and a profit to a business.

"Every man who works for a living has a three-fold duty: his duty to his family,



President George B. Wood

his duty to his employer and his duty to himself. The most important of all is his duty to himself, which is to keep fit in mind and body that he may be most useful and most valuable to others. Let's all be careful. Take care of your health and don't get hurt, but if you do get hurt let the company's doctor tend you and get back again on the job.

"Remember your family wants you tomorrow.

"Remember your employer wants you tomorrow.

"Don't call a safety campaign foolish. Tell your foreman if you see something wrong and help to make conditions better.

"Yours for Safety First,

"G. B. Wood,

"President and General Manager."

In announcing this campaign President Wood says:

"Commencing November 15, we will start a continuous safety campaign. The company plans to establish at the kiln

plants and at the quarries regularly equipped first aid stations, which will be small hospitals with every facility to give prompt and efficient attention to the patient in the event of accident. The company will employ a company doctor, who will be on duty regularly certain hours every week at these dispensaries, and whose services will be available to all employees in matters pertaining to treatment of injuries or their personal health.

"Everett Libby has entered the company's employ in the capacity of safety engineer. The Safety and Welfare Committee will be reorganized for more efficient work, and every employee will become a part of the safety first organization for the purpose of improving working conditions and lessening accidents. Mr. Libby will be the active head of this department, and it will be expected by the management that every employee will not only co-operate with him but will feel free to make recommendations or make complaints with regard to any conditions around the plant and changes which will tend to make not only a safer but a better place to work in.

"Wherever things are wrong around the plant it is known best by those who work there every day, and these are the things Mr. Libby wants to know.

"If every man will help, accidents can be stopped."

241 Years of Human Service

IN the days of rapid labor turnover and the tendency of the average workman to be here today and gone tomorrow, the recent announcement of the Adams Bag Co., Cleveland, Ohio, that it still employs six men whose combined uninterrupted service total 241 years is remarkable.

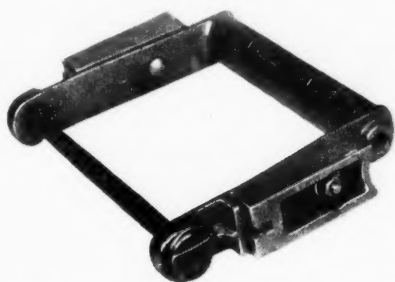
The company began operations at Chagrin Falls in 1858, and Dan Wallace, who started with it in 1871, is still actively engaged, with a record of 51 years' service. Next is Resident Manager Kline, with 49 years; Watchman Martin, 40; Superintendent Neuman, 35; Engineer Blackford, 34, and Freeman Hoobs has 32 years to his credit.

"It is a pleasure to feel," states the Adams company, "that no little of the good reputation enjoyed by our product is due to the unflagging zeal of the old guard, to whom the work has been not only a means of livelihood, but the medium of expression of the desire for human service, without which no individual attains real contentment."

New Machinery and Equipment

A New Chain for Drag Conveyors

A NEW chain for drag conveyors in cement mills has been developed by the Chain Belt Co., Milwaukee. It is known as Rex Griplock drag chain and is equipped with a special wearing shoe which not only gives the chain longer life, but makes it possible to use a lighter chain in drag conveyors.



This drag-conveyor chain is equipped with a wearing shoe to prolong its life and lighten its weight

It is well known among cement mill superintendents that ordinary malleable iron drag chain usually wears out rapidly when used in scraper conveyors. As a result some cement companies are using heavy cast-steel chain, but this chain is so heavy that it requires considerable power to drag it along in the trough. The new Rex Griplock retains the advantages of lighter weight and yet, because of its white iron wearing shoes, has a particularly long life. Two shoes are bolted to each link, one on each side, as shown in the illustration. They are so attached that there is no interference with the efficient operation of the chain over the sprocket wheels. This white iron is a well-known resistant to abrasive wear.

The links are the standard Griplock conveyor links manufactured by this company for many years. By means of the Griplock joint a series of links will form a chain without pins or bolts. The pins or bolts are necessary, however, to keep the joint locked, and because of their length assume a large portion of the load. The principal advantage of this joint is that the pin is prevented from bending for the reason that the joint will not allow the links to pull apart. In this way the chain retains its proper pitch for a much longer period.

The links are made from certified malleable iron having an average tensile strength of over 52,000 lb. and an average

elongation of over 14 per cent; both these averages are well beyond the requirements for certification. The company will send one of these links to any cement mill superintendent interested.

Rotary Cooler for Lime Hydrator

THERE has been placed on the market by H. Miscampbell, Duluth, Minn., a combination of rotary cooler and Clyde lime hydrator, shown in the accompanying illustration.

In the operation of the hydrator a definite weight of lime is thoroughly mixed with a certain percentage of water (the amount to be added depends entirely on the particular lime used, and should be accurately determined before starting to hydrate). The proportion of water passes off in the form of steam before the dust starts, and before it starts the batch should be dumped into the hopper below.

The illustration shows a conical cover over the center rim of the hydrator. This cone stops the dust from rising out of the

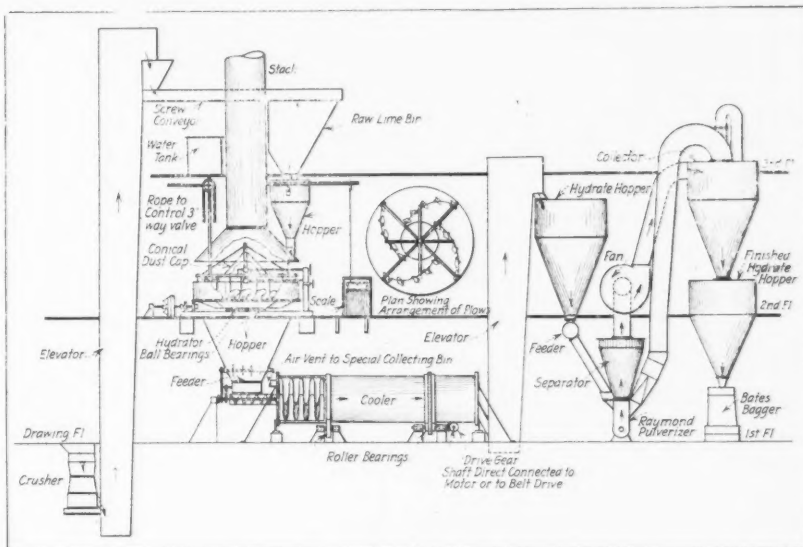
machine revolves the lime is thoroughly mixed and at the same time carried on through the cooler to the elevator.

While passing through the machine the lime is cooled by means of the circulating air. The air comes through the elevator shaft into the cooler and out through the air vent, which is piped direct to the hydrate bin. All dust carried is therefore deposited in the hydrate bin. This very fine dust, which usually passes out the stack and is lost, is the very best part of the hydrate or cream of the lime. In this process the lime is saved.

The capacity of the hydrator is greatly increased by permitting the operator to dump his batch as soon as the steam has passed off; the lime usually wasted through the stack is saved, and the dust is practically eliminated.

The cooler has a stationary helical screw with a 14-in. hole through its center. The cooler revolves at 4 r.p.m.

Another feature of the hydrator is that it has twice the number of plows it formerly had. This balances on its center and



A combination rotary cooler and lime hydrator

hopper after the batch is dumped. The hood over the hydrator is open and there is a 54-in. stack of draft and any dust arising will go down again on top of the cone and into the machine.

The lime passes from the hopper through a feeder and spiral conveyor to the cooler. This machine has stationary dustproof ends and the main shell revolves. On the inside of the shell and attached to it there is a device similar to a spiral conveyor. As the

30 times a minute is its peripheral speed. This increases the hydrating capacity by evaporating the water faster. It is said to be an ideal arrangement for a hot lime.

Eliminating Hand Labor in Loading

ELIMINATION of hand labor in loading raw materials has had the attention of every industry having to do with

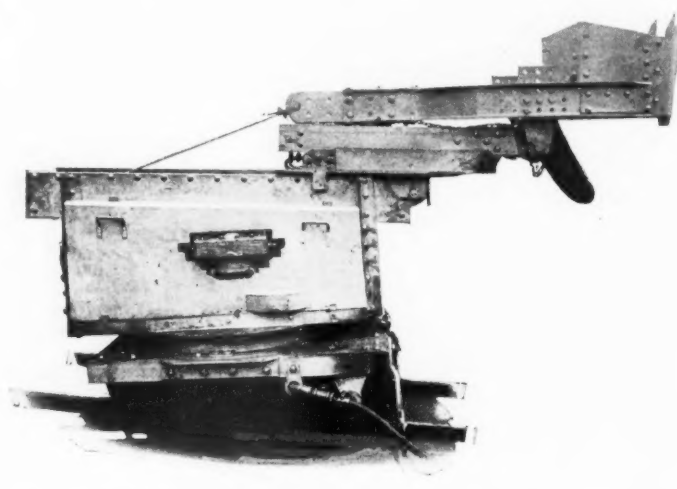
these problems, says the Hoar Shovel Co., Duluth, Minn., in introducing its shovel. The designers of this shovel have duplicated the action of the steam shovel and yet turned it out in such size as would enable it to be used in drifts and underground crosscuts and on the surface where the tonnage would not warrant installing the larger equipment.

The Hoar shovel, really a miniature steam

is used for loading, the shovel has cut costs there as well as underground. The fact that the cost of the equipment is so small in comparison to the regular excavating equipment on the market permits it to be used where the tonnage moved would not

combination rates both with and without the Kelly deductions.

Mr. Gubernator declared that it was unfair to make through fixed rates which were higher than combination rates. The present combination rate for his company



To the left is shown the shovel in detail. The smaller illustration shows the operator ready to start on the job

shovel, has been operating in a number of mines and tunnels for the past five years. On one of the largest tunnel jobs in this country this equipment showed costs for repair parts of but .0107 cents per ton in the moving of some 18,000 tons of rock, it is claimed. As may be seen from the illustrations, the shovel is fully revolving—capable of duplicating any action of the steam shovel—and requires but 6 ft. of headroom and a width of 6 ft. in which to operate. Power is supplied by three reversible Duke motors operating by compressed air or steam. Use of these reversible motors makes it unnecessary to employ clutches and gives a quick, positive action.

Operation is through three levers directly in front of the operator, who can see every movement of the dipper. The dipper itself, patterned after the standard steam shovel dipper, is fastened to a dipper stick which is in turn connected to a double floating dipper stick that permits flexibility in cleaning up a rough bottom and allows the dipper stick to be racked back over the body of the machine before swinging in congested places. When dumping, the crowding engine shoves the dipper sticks out in a horizontal position over the car and then racks it back again to the body position for the return swing.

One man is all that is necessary to operate, the shovel doing its own cleaning up, trimming of cars and propels itself over short distances by dropping the dipper against the side of the drift or on the ground and crowding out. The saving this machine will make over hand labor is calculated at 50 per cent and the speed of the loading operation increased nearly as much.

In surface operations where hand labor

warrant the purchase of larger units. In most cases the tonnage to be handled from any one blast exceeds that in the metal mines, permitting the shovel to be continuously employed.

Lehigh Cement Co. Protests Rates

A PROTEST by the Lehigh Portland Cement Co., Chicago, against unfair rates on their product, between Oglesby, La Salle and Dixon, Ill., Hannibal and Iasco Junction, Mo., and certain Kentucky points was heard before Examiner Carter in Chicago on October 17, says *Traffic World*.

B. T. Jones, for the Central Freight Tariff Bureau, appeared for the carriers. He stated that the tariff in contention was intended to reduce certain rates in the original tariff which had been made too high through the use of erroneous factors. These errors were said to have been made in the fourth section adjustments of the tariff. The witness stated that the correction of the errors through the tariff which is now suspended would make the rates to Kentucky points lower than those now published. He concluded by saying that the combination rule tariff is not intended, or is it being applied, to reduce through rates.

E. S. Gubernator, traffic manager of the Lehigh Portland Cement Co., testified for the protestants. This company maintains plants at points in the district under controversy. The complainant had prepared numerous charts and maps showing the history of rates on cement in its district, as well as comparisons of fixed rates with

to Central City, Ky., he gave as 21 cents as compared with the 24 cents of the tariff now being protested. In response to the statement that the new rates were intended to correct the errors in the fourth section adjustments, he said that the new rates would have the effect of aggravating the situation. Mr. Gubernator also called attention to the fact that southbound rates into Kentucky are nearly 50 per cent higher than the northbound rates from the same points.

"I do not know of any rates in the United States that are in worse condition than the cement rates in Kentucky," he declared. "The constant changes in the rates have put the whole rate structure into a state of chaos." Mr. Gubernator urged an investigation by all the carriers, so that fair fixed rates might replace the multitude of combination rates now in use.

A New Swedish Potash Fertilizer

A NEW form of potash fertilizer has been introduced in Sweden under the name of "Electrokali," says the *Commercial Fertilizer*. This material is said to comprise finely ground slag from the electric furnace manufacture of ferrosilicon from feldspar and iron turnings.

This new product is particularly interesting for it indicates that the steel plant by-products, materials which the plant was originally only too glad to get rid of in some easy manner by dumping into swamps, rivers, etc., are being used profitably in the manufacture of potash fertilizers.

News of All the Industry

Incorporations

The Two States Lime Co., Chicago, Ill., has been incorporated for \$204,000.

The Blue Black Slate Co., Philadelphia, Pa., has been incorporated for \$100,000.

The Wabigoon Soapstone Co., Ltd., Toronto, has been incorporated for \$500,000.

The Morgan and Bird Gravel Co., Inc., Shreveport, La., has been incorporated for \$300,000.

The Great Western Lime and Cement Co., Los Angeles, Calif., has been incorporated for \$1,000,000.

The H. L. Cannady Co., Wilmington, Del., has been incorporated for \$100,000, to operate a stone quarry.

The American Cement and Plaster Co., Salt Lake City, Utah, has been incorporated for \$500,000.

The New York and Porto Rico Lime and Cement Industries, Wilmington, Del., has been incorporated for \$750,000.

The Turner Gravel Co., San Antonio, Tex., has been incorporated for \$50,000, by A. P. Turner, L. Retlage and J. Aiken.

The Consolidated Cut Stone Co., Tulsa, Okla., has been incorporated for \$50,000, by J. L. Bauman, M. J. Bauman and H. D. Lanham.

The Imperial Granite Co., Quincy, Mass., has been incorporated for \$20,000, by S. W. Giarrusso, president; A. J. Restelli, treasurer; and A. D. Martin.

The New England Concrete Products Co., Boston, Mass., has been incorporated with W. J. Scholes, president; K. W. Battis, treasurer; and Wm. J. L. Roop.

The Moore Sand and Gravel Co., Boston, Mass., has been incorporated for \$36,000, by Wm. J. L. Roop, Melrose; A. H. Hall, Arlington; and A. C. Moore, Watertown.

The Holmes Sand and Gravel Products Co., Millersburg, O., has been incorporated for \$100,000 by C. C. Geib, P. H. Damon, W. F. Carver and J. W. Fenton.

The Autoclave Portland Cement Co., Philadelphia, Pa., has been incorporated for \$100,000, by H. J. Force, W. L. Whitehouse and J. H. Schneider, Scranton.

The Magnesite Cement Products, Inc., Boston, Mass., has been incorporated for \$100,000, with H. P. Page, president; H. H. Smith, treasurer, Belmont; and F. M. Smith.

The Hernando Hard Rock Co., Tampa, Fla., has been incorporated for \$50,000, with J. M. Harvey, president; I. Berner, vice-president; and H. P. Harvey, secretary and treasurer.

Cement

The Beaver Portland Cement Co., Grants Pass, Ore., is planning extensive development work including three miles of railroad and 6000 ft. of tramway.

The Jones Bros. brick and cement plant, Patchogue, L. I., has been purchased by a syndicate of Brooklyn and Long Island business men for \$1,000,000. The plant will be enlarged by the addition of several new fireproof warehouses.

The Riverside Portland Cement Co. has been making extensive investigations of its limestone deposits at Springville, Calif., under the direction of H. L. Thomas, general superintendent, and extensive development in the lime deposits is being contemplated.

Fred A. Ballin, president of the Monolith Portland Cement Co., Monolith, Calif., is on a buying and inspection tour in the East and plans to visit many of the largest cement plants in the country to study general conditions in the industry. He also plans to buy a few locomotives and extra railway cars to be used at the plant. New machinery and buildings have been erected to double the capacity of the plant. The company owns its own railroad and locomotives and freight cars. The company recently made its first shipment of plastic waterproof portland cement to San Francisco.

Lime

The Calera Lime Works, Calera, Ala., has placed the output of its plant for the next year operating at full time. An additional kiln of the latest design has just been completed. The company owns a large deposit of limestone on which analysis is 99.89 per cent calcium oxide, from which the lime is manufactured.

The Penn Limestone and Cement Co., Elizabethtown, Pa., is operating its plant at full capacity. A shortage of labor is being experienced.

The Pine Plains Lime Co., Pine Plains, N. Y., has been organized and will operate a large limestone plant to supply ground limestone to farmers. J. P. Barton, Pine Plains, and C. J. Hackett, Brooklyn, are the owners.

The St. Maurice Lime Co.'s plant at St. Louis de France, near Three Rivers, Que., is being enlarged from two to six kiln capacity, which will give the plant a production of 600 tons of lime per week. The company has also under construction a railway siding connecting the plant with Piles Junction at an estimated cost of \$175,000. A contract has been let for a new lime furnace to cost \$23,000.

The San Bernardino Valley Lime and Rock Co., Colton, Calif., operating quarries at San Bernardino, is planning for enlargement and expansion of its operations and is offering 100,000 shares of stock for sale to raise its capital, and to help finance the project. The company's claim consists of 98 per cent lime rock. The entire length, some 3000 ft., permits strip operation. The rock after being quarried is hauled to Colton by truck, the refining plant being maintained there. Besides the lime, the company turns out lime by-products of fertilizer, sand, roofing material and orange spray. Building brick is also manufactured on a large scale.

Concrete Products

The Koutsky-Brennan-Vana Co., South Omaha, Neb., will erect a cement block manufacturing plant.

The Emerlite Products Co., Ely, Minn., contemplates the enlargement of its stone crushing plant.

The Hercules Products Co., St. Joseph, Mich., has increased its capital stock from \$5,000 to \$55,000.

The Superior Concrete Products, Ltd., Toronto, Ont., has been incorporated for \$50,000 to manufacture concrete products.

The Elhide Co., Wilmington, Del., has been incorporated for \$1,000,000, to manufacture and deal in roofing and paving materials.

The Minnesota Cement Construction Co., Minneapolis, Minn., has begun the erection of a concrete products factory to cost about \$4,000.

The Corkstone Products Corp., Baltimore, Md., recently incorporated, has organized with Albert Rankin, president and treasurer, and I. Weinberg, secretary.

The Johns & Wood Novelty Stone Works is now operating its plant at Hamilton, Ont., with a daily capacity of five carloads. The company manufactures stone for stucco, terrazzo, etc., and roofing gravel and stone. The company operates its own quarries.

The Drury Manufacturing Co., Inc., Mineola, N. Y., has been incorporated for \$15,000, and will engage in the manufacture of brick, tile, etc., and do a general contracting business. Directors are W. F. Drury, Mineola; R. C. Hunt, Manhattan; and T. G. Horton, Rahway, N. J.

The Arundel-Shope Brick Co., Baltimore, Md., has been incorporated for \$10,000, and will erect a plant in Brooklyn, Md., to manufacture concrete face bricks. L. W. Wagner is president.

The Owatonna Cement Tile Co., Owatonna, Minn., will build a new drying shed and make other improvements next spring.

Quarries

The Ohio Marble Co., Piqua, Ohio, is building storage bins for 30,000 tons of agricultural limestone.

Robert Lutz, Oshkosh, Wis., has let the contract for the erection of a \$75,000 crushing plant.

The New York Trap Rock Co. will spend \$200,000 at its Cedar Cliff Quarry, Cedar Cliff, N. Y., on the Hudson river, opposite Poughkeepsie, in converting its present quarry operation to a steam shovel operation. The work includes the addition of several large crushers and other changes in the plant.

The Red Wing Quarry Co., Ltd., North Bay, Ont., contemplates constructing a large crushing plant for the preparation of stone aggregates for use in stucco, magnesite, terrazzo, tile floors, grits, etc. Deposits of different varieties of rock has been acquired. The building site consists of eight acres and an authorized capital of \$500,000. A. T. Stone is president; J. H. Bremer, secretary and treasurer; and H. Stockdale, general manager.

Manufacturers

The Reliance Gauge Column Co., Cleveland, Ohio, announces that the Cleveland Clutch business has been sold to the Western Engineering and Mfg. Co., 360 East Grand avenue, Chicago, which has been incorporated as a subsidiary of the Western Valve Bag Co., for the purpose of taking over the manufacture and marketing of this clutch. Increased demand in the Reliance company's steam specialty line, together with the developing of its new method float, has caused it to dispose of its clutch business. Due to larger shop equipment and greater engineering organization, the new company will be capable of insuring better service than has been possible in the past.

Personal

H. S. Van Scoyoc, of the Canada Cement Co., Ltd., Montreal, has been elected president of the Association of Canadian Advertisers.

J. W. McCann will represent the Ontario Gypsum Co., Ltd., Paris, Ont., in the Windsor district. Mr. McCann was formerly with J. Muldoon & Co., Toronto.

A. G. Bennett, formerly with the Montreal Crushed Stone Co., Ltd., is now with the John E. Russell Co., Ltd., Toronto, manufacturers of concrete pipe, sand, gravel and crushed stone.

Hon. J. P. B. Casgrain and Hon. J. L. Perron, Montreal, were appointed directors of the Canada Cement Co., Ltd., Montreal, at the recent annual meeting. J. C. Cox, Toronto, has resigned.

William Hicks, superintendent of the Alpha Cement plant, Cementon, N. Y., for the past four years, has been promoted to superintendent of construction, which new duties call for his covering all the plants of the Alpha Company.

E. C. Wilson, formerly connected with the U.S. Light and Heat Corp. and the Vapor Car Heating Co., with offices at Chicago, has been appointed western sales manager for the Ohio Locomotive Crane Co., Bucyrus, Ohio, with offices in the Railway Exchange Building, Chicago.

M. E. Pullen, of the Osgood Co., Marion, O., is in charge of the district sales office, 50 Church Street, New York. All of the business of the Osgood Co., which was formerly handled by M. E. Davis, the former New York representative, will now be handled through the district office.

Used Equipment

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid for in advance of insertion.

Telephone
Court 4508-4509

H. R. EICHER

608-609 Maloney Bldg.
Pittsburgh, Penna.

We have purchased from the Consolidation Coal Co. and the Cumberland & Pennsylvania R. R. Co. all of their Surplus Equipment. In this lot we have listed below some of the items and equipment that might be of interest to you at a very low figure. This material is all in A-1 condition, mechanically and otherwise, and will be loaded f. o. b. Frostburg, Md., and can be inspected at that point. Detailed specification on any item obtainable at our Pittsburgh office.

- 1—Norwalk 3-stage Air Compressor, straight line with intercoolers; steam pressure 125 lb.; air pressure 900 lb.; capacity 750 cu. ft. at 85 R.P.M.
- 1—Ingersoll Duplex Cooper-Corliss, steam pressure 125 lb.; air pressure 900 lb.; capacity 1409 cu. ft. free air at 80 R.P.M.
- 1—Ingersoll Duplex Cooper-Corliss 3-stage with intercooler; steam pressure 125 lb.; air pressure 900 lb.; capacity 800 cu. ft. at 90 R.P.M.
- 1—Ingersoll-Sargeant straight line; steam pressure 125 lb.; air pressure 150 lb.; capacity 1442 cu. ft. at 80 R.P.M.
- 1—Ingersoll straight line; steam pressure 125 lb. air pressure 150 lb.; capacity 382 cu. ft. at 100 R.P.M.
- 1—Rand straight line, steam pressure 125 lb.; air pressure 150 lb.; capacity 380 cu. ft. free air per minute at 125 R.P.M.
- 2—Ingersoll-Rand Imperial Type 10, capacity 1319 cu. ft. per minute; piston displacement at 150 R.P.M.; complete with 1-KY General Electric 200 H.P. Motor 3-phase, 60 cycle, 220 volts; 600 R.P.M. with C. R. 1034-H3 Compensator base and pulley 24x32x5; also complete with Air Receivers, Gauges, Fittings, etc.
- 1—Ingersoll-Rand Class J-2 single acting 2-stage 24½x14½x18 in.; capacity 1000 cu. ft.; maximum pressure 100 lb. at 135 R.P.M.; complete with 1-200 H.P. Westinghouse Motor 3-phase, 60 cycle, 220 volts with slide rails, pulley and starting device; also 1-55-ft. 21-in. 2-ply Endless Leather Belt; complete with Air Receivers, Gauges, Fittings, etc.
- 3—Air Receivers, 30-in. dia. x 20 ft. long, tested 1000 lb. pressure.
- 1—Air Receiver, 60 in. dia. x 12 ft. long, tested 150 lb. pressure.
- 1—Air Receiver, 30 in. dia. x 6 ft. long, tested 150 lb. pressure.
- 1—150 H.P. Butt strapped triple riveted H. R. T. Boiler, complete with stacks, fronts, fittings, buck-stays, etc.
- 2—125 H.P. H. R. T. Boilers, complete, same as above.
- 2—Westinghouse Standard Steam Engines, 7½x7 in., 350 R.P.M., 20 H.P.
- 1—Case Steam Engine, 8 H.P., pulley 18 in. x 6½ face, flywheels 18x5½, 648 R.P.M.
- 1—110 K.W. Allis-Chalmers A.C. Generator, 2200 volts, 225 R.P.M. direct connected to Harrisburg steam engine 16x14, 150 H.P., 225 R.P.M.
- 2—150 K.W. Westinghouse D.C. Generators, 250-275 volts, 550 R.P.M.
- 1—160 H.P. Buckeye Generator Engine, 18x18½, pulley 90 in. x 26 in., 200 R.P.M.
- 1—Westinghouse stand. engine, 7½x7 in., 350 R.P.M., 125 lb. pressure direct connected to 15 K.W. Wood Generator, type MPL Compound wound, 350 R.P.M. 125 volts, complete with switchboard, instruments, main line switches, fuses, etc.
- 1—7x10 Single Drum double cylinder Mine Hoist; drum dia. 40 in., face 40 in.
- 1—Double Drum Haulage Hoisting Engine; drums set side by side; 10x12, 40 in. drum dia., 40 in. face, flange 4½ in.; levers banked.
- 1—H. K. Porter Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
- 1—Baldwin Air Locomotive, 6 wheel, 16 ton, 36 in. gauge.
- 1—H. K. Porter Air Locomotive, 6 wheel, 15 ton, 36 in. gauge.
- 1—Baldwin Compound Locomotive, 10 ton, 36 in. gauge.
- 4—Baldwin Gathering Locomotives, 4 ton, 36 in. gauge.
- 1—Cameron special Plunger Pump.
- 1—No. 3 Cameron Plunger Pump.
- 3—No. 9 Cameron Plunger Pumps, all bronze ends.
- 1—Cameron Boiler Feed Pump, 300 H.P.
- 1—Boiler Feed Duplex Pump, 7x4x10.
- 2—MacGowan Pressure Pumps, 6x10-5 in. suction, 4 in. discharge.
- 1—8-ft. Cast Iron Sheave; 1 5-ft. C. I. Sheave; 1 42-in. Cast Iron Sheave.
- 1—Storage Oil Tank, 8 ft. diameter, 30 ft. long.
- 1—Lot Steel Shafting ranging from 2 in. to 10 in. in diameter.
- 1—Lot Forged and Nicked Steel, including some case hardened material in lengths from 4 ft. to 20 ft.
- 1—Miscellaneous lot of Pipe, Pipe Fittings, High and Low Pressure Valves, etc.

FOR SALE

Bucyrus Steam Shovel, model 45-C, shop 1147, with 1½ yd. dipper, mounted on standard R. R. trucks. Has had but little service and is in good operating condition ready for work. No further use for it and will sell at reasonable price. Address

Bodine Stone Co., Buffalo Station, Va.

FOR SALE

Ballast plant with a splendid business located on trunk line R. R. not far from Washington, D. C. Have 7½ and 5 crushers. Plenty of orders and cars. Fine chance for expansion. Now in successful operation with good profits. Good reasons for selling. Address the owner,

Box 1599, Care Rock Products
542 So. Dearborn St. Chicago, Ill.

EQUIPMENT

The quickest way to find the bargains in new and used equipment or dispose of any surplus you have is to write, wire or phone

A. T. McLEOD

1515 First National Bank Bldg. Chicago

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK

Frick Building Pittsburgh, Pa.

Machinery Wanted

- 2 Sets Roll Crushers, 24" or over.
- 1 Jaw Crusher, 12"x20".
- 1 Belt Driven Compressor, 10"x12".
- 1 Steel Derrick, 100 ft. boom, 10 ton capacity.
- 1 A. C. Electric Hoist, 10 ton capacity.
- 2,000 ft. 14 lb. Rails.
- 1 2 unit Hammer or Newago Screen.
- 1 36"x16' Revolving Screen.

State make, size, condition, price and location in first letter.

TRITSCHLER & SONS, Inc.

220 West 42nd Street New York, N. Y.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

Used Equipment

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion

- 1—50-ton standard gauge Brooks 6-wheel switcher.
- 1—39-ton standard gauge Baldwin 6-wheel switcher with separate tender.
- 1—42-ton standard gauge Shay geared locomotive.
- 1—12x18" standard gauge 4-wheel saddle tank.
- 1—9-ton 36" gauge 4-wheel saddle tank.
- 1—23-ton new 36" gauge Porter 6-wheeler with tender.
- 10—5-ton 36" gauge storage battery locomotives.
- 1—14-B Bucyrus steam shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR SALE

- 1—48-inch Symons Disc Crusher—Manganese fitted, in good running order; also new spare parts to the value of about \$1000.

This crusher has broken less than 50,000 tons of rock and is in first-class shape. Can be inspected at Richard Mine, Wharton, N. J. Reasonably priced. For full particulars address:

The Thomas Iron Company
Hokendauqua, Penna.

IMMEDIATE DELIVERY

Send Us Your Steam Shovel Inquiries

66x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½ and 9 CRUSHERS.
6 & 12 ton gasoline locomotives.
NEW-1469 ft. SULLIVAN COMP., 2-STAGE, \$1900.
2 DISC CRUSHERS, 36 & 24 in. SYMONS.
100-ton 2½ yd. ELECTRIC SHOVEL.
Columbus Portable Conveyor, 25 ft. Eng. drive.
50 to 5000 ft. Steam, Belt, Elec. drive Comp.
JAW AND ROLL CRUSHERS.
10-15 and 20 ton Locomotive Cranes.
13x30 in., 10x18 in., 9x14 in. JAW CRUSHERS.
NEW-1000 GPM. 100 lb. Cent. Pump, Motor Dr.
1000 GPM. UNDERWRITERS STEAM PUMP—Prac. New.
24x34 McLANAHAN ROLL CRUSHER.
Send us your inquiries for Steam Engines, Cent. Pumps, Quarry and Contrs. Equip., etc.
ROSS POWER EQUIPMENT CO.
Indianapolis, Ind.

QUARRY EQUIPMENT

- 4—20 yd. Steel Underframe Side Dump Cars.
- 3—16 yd. Steel Underframe Western Dump Cars.
- 10—1½ yd. Western Dump Cars.
- 2—10x16 Davenport 36 in. ga. Saddle Tanks.
- 1—11x16 American 36 in. ga. Saddle Tank.
- 1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
- 1—¾ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½ x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20", 8x11", 5x20", 5½x22" and 6x20" tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant", No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Felsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors.

W. P. Heineken, Engineer

95 Liberty Street, New York. Tel. Cortland 1841

No. 5 Crushing Plant For Sale

We have in southern Indiana a No. 5 crushing and agricultural limestone plant for sale. This plant has a No. 5 Austin crusher, elevator and screen. Also a large size Day pulverizer. This is a good opportunity for a hustling crushing man.

Write Box 271, Muncie, Indiana

FOR SALE

Two No. 4 Semi-Vulcanite Williams Crushers at \$1400.00 each, and two No. 5 McCulley Gytratory Crushers at \$1500.00 each. All second hand but guaranteed to be in good condition.

Dewey Portland Cement Co.

Dewey, Oklahoma

WANTED

6'x16" or 6'x22" Hardinge Conical Mill, with scoop feed. Stone-lined with charge of pebbles. Want used mill but must be in good condition

Address Box 1598, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

DEPENDABLE SERVICE

Hyman-Michaels Co.

531 Peoples Gas Bldg., Chicago, Ill.

RELAYING RAILS AND ANGLE BARS

In All Weights, 30 to 100 Lb. to the Yd.

**Quick Shipment
Dependable Service**

Get Our Quotations Today

**We Also Cut Rails to Lengths for
Props, Etc.**

OFFICES AT

New York City, 1324 Woolworth Bldg.
Pittsburgh, Pa., 1312 1st Nat'l Bank Bldg.
St. Louis, Mo., 2115 Railway Ex. Bldg.

FOR RENT AND SALE

- 14—4-yd. 36-in. ga. heavy duty Western dump cars.
- 20—12-yd. Western air dump cars, std. gauge.
- 50—60,000-lb. capacity flat and box cars.
- 1—Western standard gauge spreader, used sixty days.
- 1—Osgood 18 revolving shovel, traction wheels, No. 794.
- 1—¾ yd. bucket, built 1920.
- 1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
- 1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, built 1921.
- 2—Equate 40-S 1-yd. side discharge concrete mixers, with steam engine and boiler.
- 32—NEW 20-in. I beams, 80 lbs. per foot, 40 feet long, not drilled.
- 1—NEW Lakewood concrete chuting system.

LOCOMOTIVES

- 1—50-ton 18x24-in. six-wheel switcher.
- 1—40-ton 17x24-in. four-wheel switcher.
- 2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
- 2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.

McCormick Building Chicago, Illinois

FOR SALE

Centrifugal Pump

Manufactured by the Allis-Chalmers Mfg. Company

1—3 inch three stage horizontal split casing centrifugal pump with base plate and coupling direct connected to 1 50 HP., 1750 REV., 3 phase, 60 cycle, 2200 volt squirrel cage motor complete with potential starter having overload relay and undervoltage release. Practically new and in first class condition.

Marquette Stone Products Co.

McGregor, Iowa

WANTED

A Broughton Mixer. Must be in good condition and reasonably priced.

Fischer Lime & Cement Company

P. O. Box 932 Memphis, Tenn.

When writing advertisers please mention ROCK PRODUCTS

Used Equipment

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid for in advance of insertion.

FOR SALE

Unused Emerson Brantingham Double Cylinder Single Drum **Hoists** in first-class condition, f.o.b. Chicago, \$85 each. Immediate shipment. Full specifications furnished on application.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago

FOR SALE

- | | |
|--|------------------------|
| 2—8x110' Rotary Kilns. | 3—5½x22' Tube Mills. |
| 5—5x6x7x110' Rotary Kilns. | 2—6x50' Rotary Dryers. |
| 5—5x21' Tube Mills (1 has Silax lining, 3 steel lining, 1 without lining). | 3—Kominuters. |
| 1—4' 6"x40' Coal Dryer. | 6—Krupp Ball Mills. |
| 2—No. 6 Gates Crushers. | 3—33" Fuller Mills. |
| | 2—6x60' Rotary Dryers. |

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

Classified Advertising

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid for in advance of insertion.

WANTED

A good Cement Mill Superintendent who is familiar with the design and construction of a Cement Plant and the operation of same using the Wet Process. Must be competent to take full charge of building the plant and operating after completion. Would prefer a man who has had engineering experience as well as practical operating. In replying, give full details of experience in the Cement business, together with any recommendations you can furnish. Also state age and whether married or single and what salary expected. All correspondence will be kept strictly confidential. Address

Box No. 297, Zanesville, Ohio

WANTED

Thoroughly competent Superintendent to take charge large trap rock quarry located near New York City. Only reliable, capable man with good references need apply; steady position, good salary for proper man. Address

W. R. WILSON,
50 Church Street, New York City

WANTED

Superintendent of several years' experience with all kinds of crushing and separating machinery. Would like to locate with some good rock crushing and grinding plant or small cement plant. A permanent position desired.

Address Box 1595, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

SALES ENGINEER

For Chicago Office and Central States territory, to sell on salary, high grade line of hammer mills, single roll crushers, Bradford breakers for cement plants, coal mines, lime plants, etc. This job has a future for right man who must be thoroughly responsible, alert, clean cut, aggressive, age 30 to 40 and who can get results. State age, experience, references, salary.

Address Box 1600, Care Rock Products
542 S. Dearborn St., Chicago, Ill.

WANTED

A first-class Engineer who is thoroughly acquainted with designing and building a Portland Cement Plant using the Wet Process. A good place for a competent man. All correspondence will be kept strictly confidential. Address

Box No. 297, Zanesville, Ohio

FOR SALE

Good sand and gravel business.

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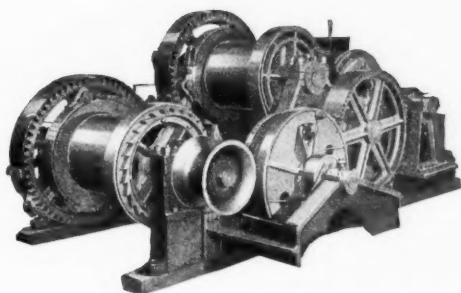
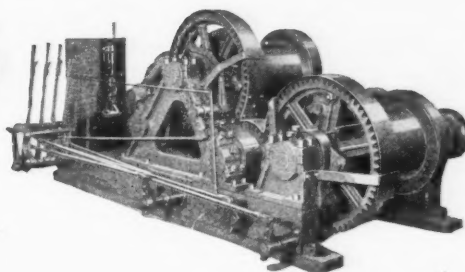
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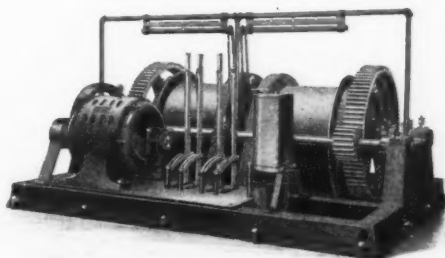
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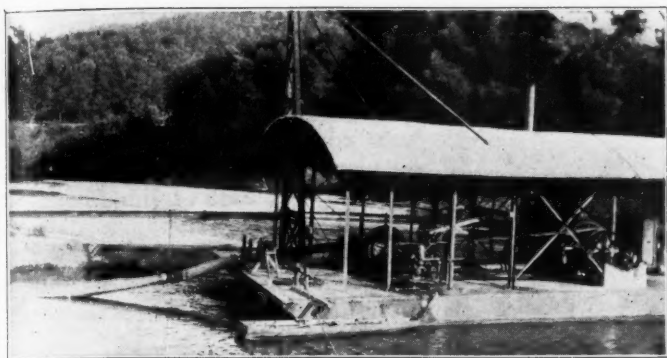
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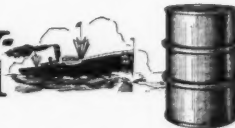
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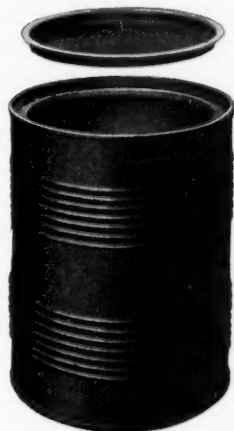


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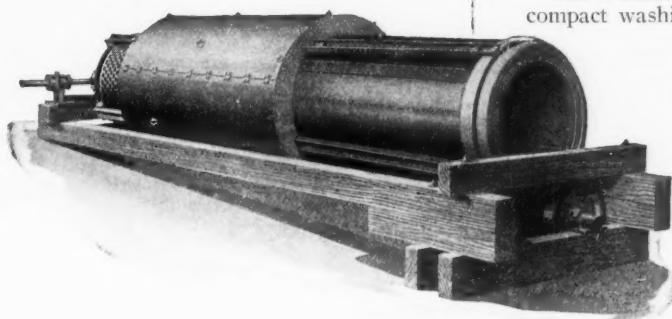
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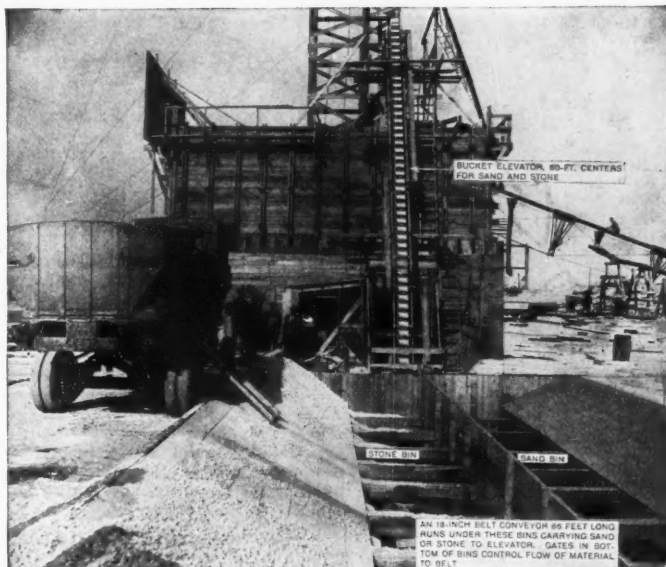
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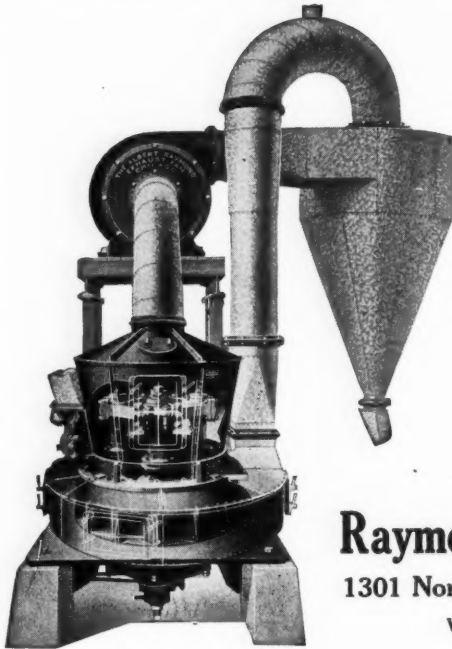
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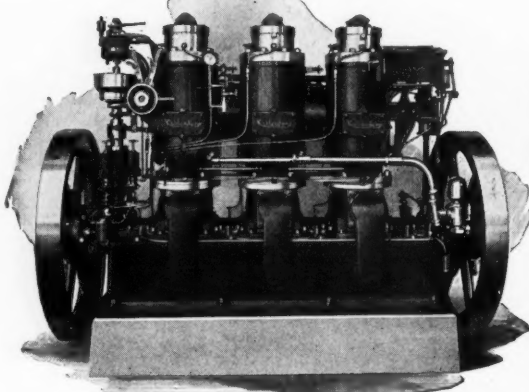
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1720 12th St., Two Rivers, Wis., U. S. A.

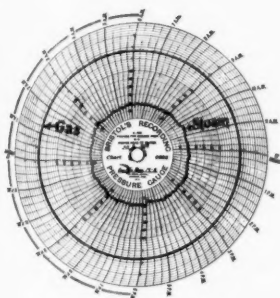
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Kahlenberg engines are very simple and easily operated by any man of ordinary intelligence — no valves to regulate, no high pressure air — automatic regulation and lubrication throughout.

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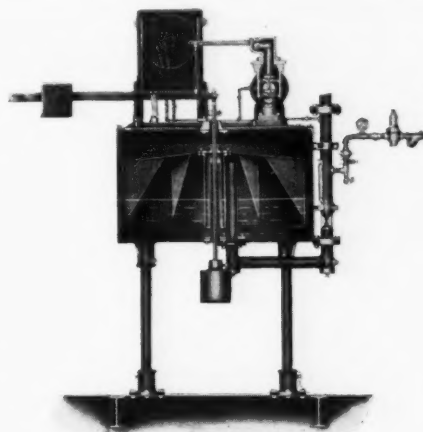
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The quality of lime does not always depend on the stone used; more often the character of the product is reflected by conditions governing kiln operations.

For instance, the use of the Chowning Regulator by the Rockland-Rockport Lime Corporation, enables this organization to burn their lime right — to get constant, uniform and reliable results, economically.

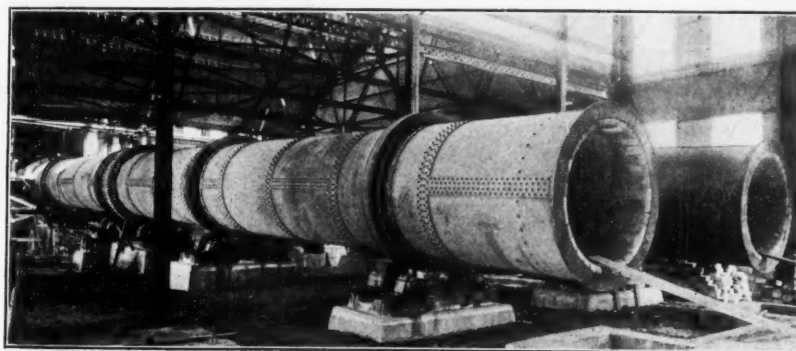
The function of this regulator is to control the quantity of gas generated in the producer, to meet actual requirements. This is accomplished by regulating the quantity of steam admitted to the gas producer by the gas pressure; resulting in a uniform pressure in the gas main to the furnace. The first installation of the Chowning Regulator in a lime burning plant was made at the Rockland-Rockport plant, where it is "making good" every claim we have made.

CHOWNING REGULATOR CORPORATION
Corning, N. Y.



Sectional View of Chowning Regulator

Two of the 120' x 8'0" kilns installed for the Tidewater Portland Cement Company



The plant is located at Union Bridge, Maryland, and has a daily capacity of 4200 barrels—dry process. Coal is used in the burning.

This is but one of 960 Vulcan kiln installations. If you are interested in kilns, write us and we'll give you the address of the Vulcan Kiln nearest you. We'll also send our book on Vulcan Rotary Kilns and Coolers.

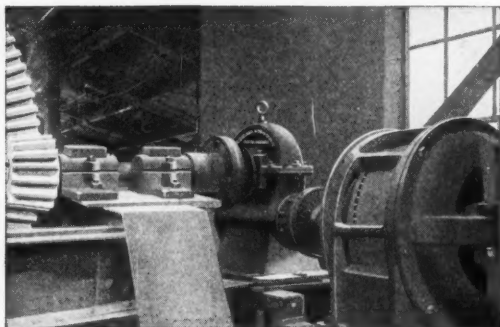
VULCAN IRON WORKS, Established 1849

1753 Main Street

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Cleveland Worm Gear Reduction Unit applied to revolving screen. Motor 25 H.P. at 860 R.P.M. Ratio in worm drive $7\frac{1}{2}$ to 1

Do users have any trouble with Cleveland Worm Gearing?

The short, quick answer is NO. And that's the unanimous answer of users.

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But we don't ask you to take our word for it.

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Let its operation and service tell you its story. We know now that its story will be a story of complete satisfaction, high efficiency and "No Trouble."

The Cleveland Worm & Gear Co.

America's Worm Gear Specialists
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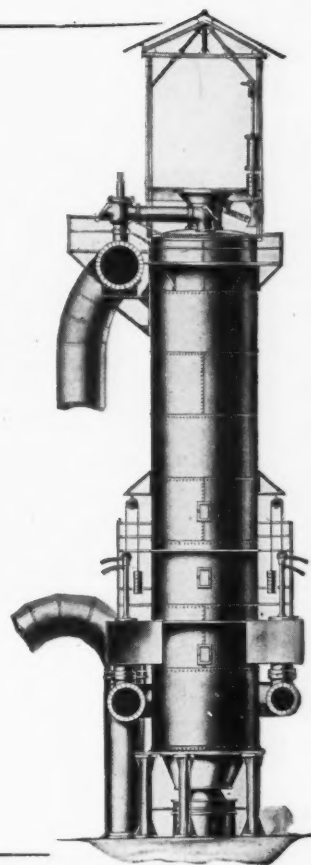
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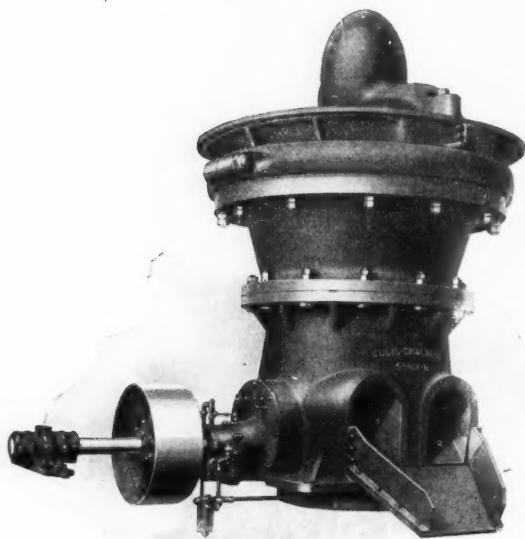
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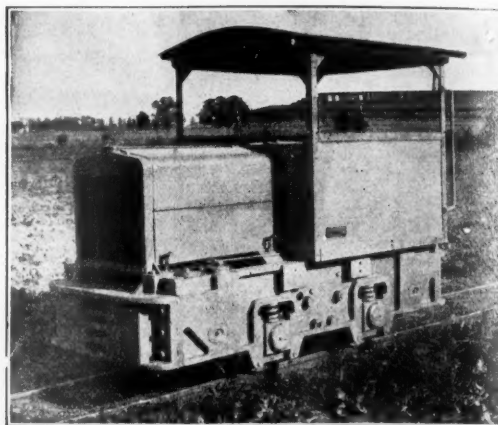
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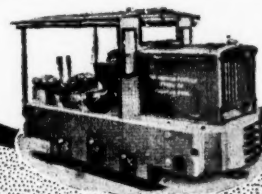
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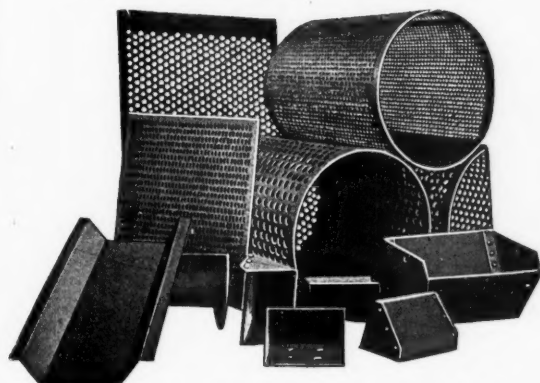
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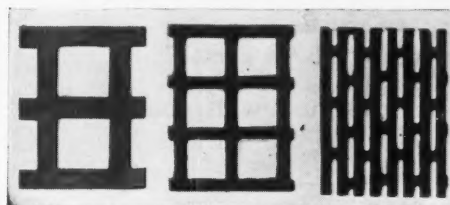
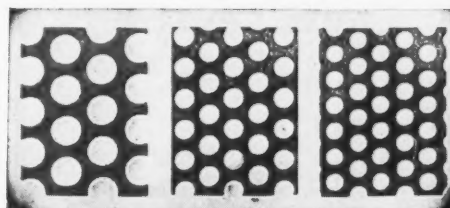
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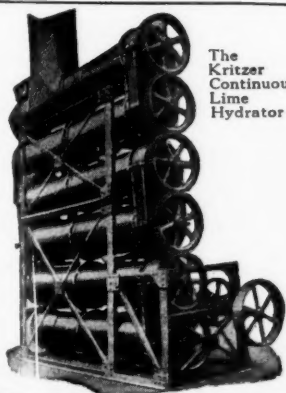
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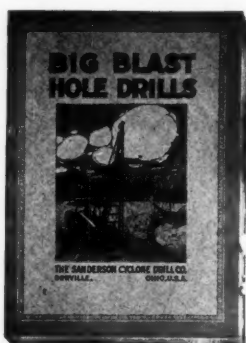
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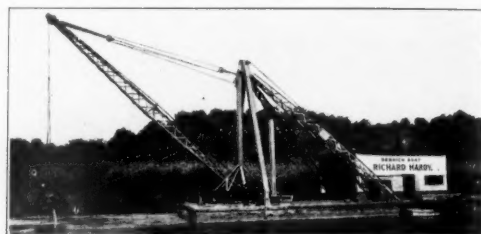
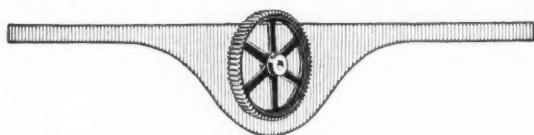
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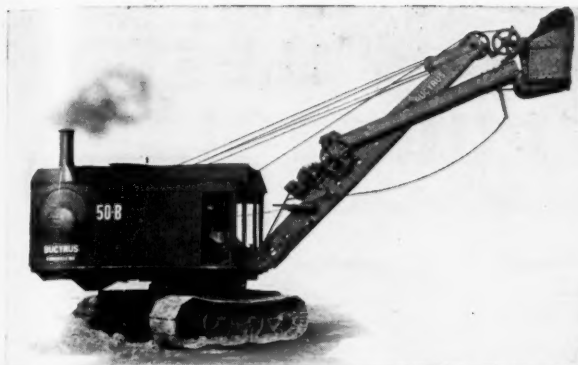
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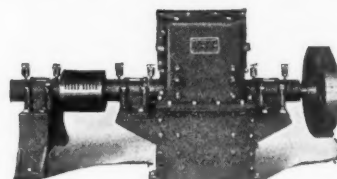


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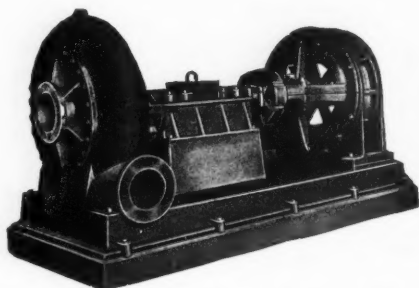
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It is built in sizes from 4 in. up, arranged for
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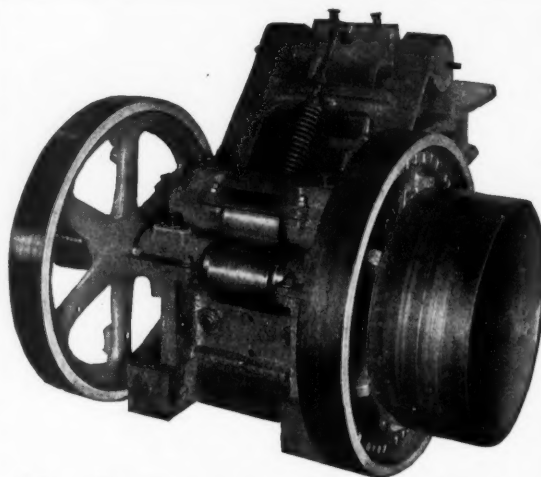
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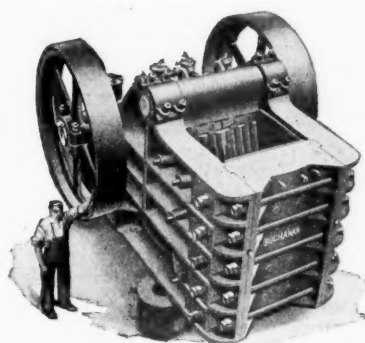
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TYPE "C" JAW CRUSHER

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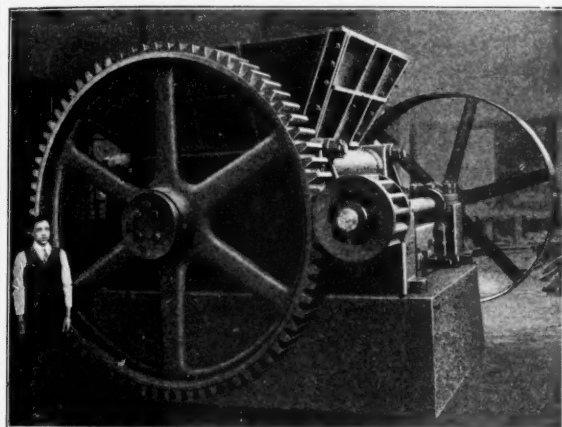
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C. G. BUCHANAN COMPANY, Inc.
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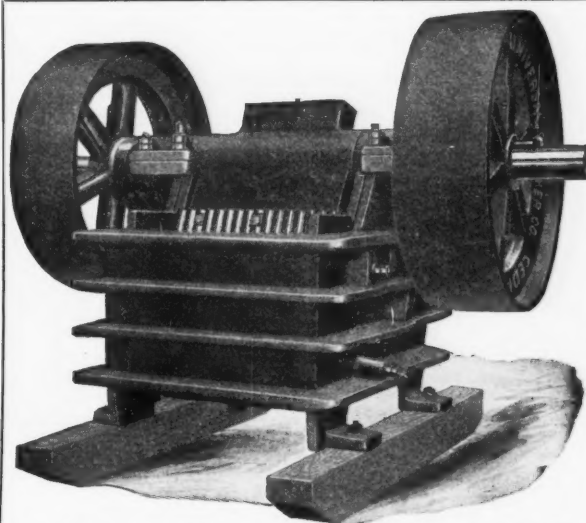
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UNIVERSAL CRUSHER CO.

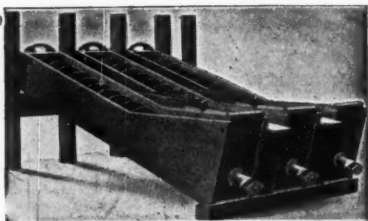
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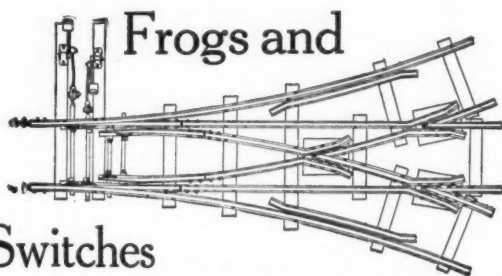
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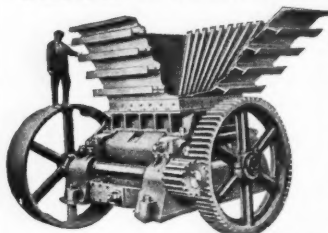
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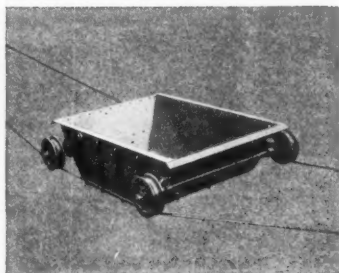


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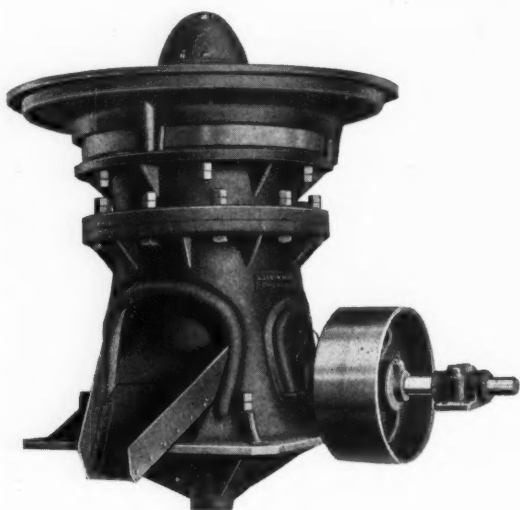
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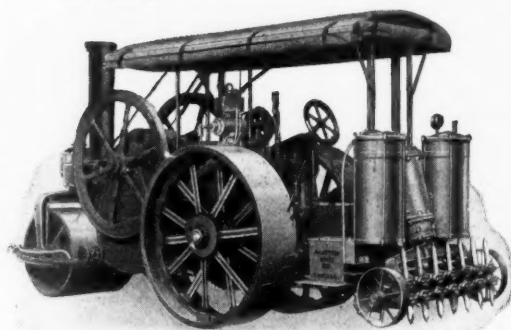
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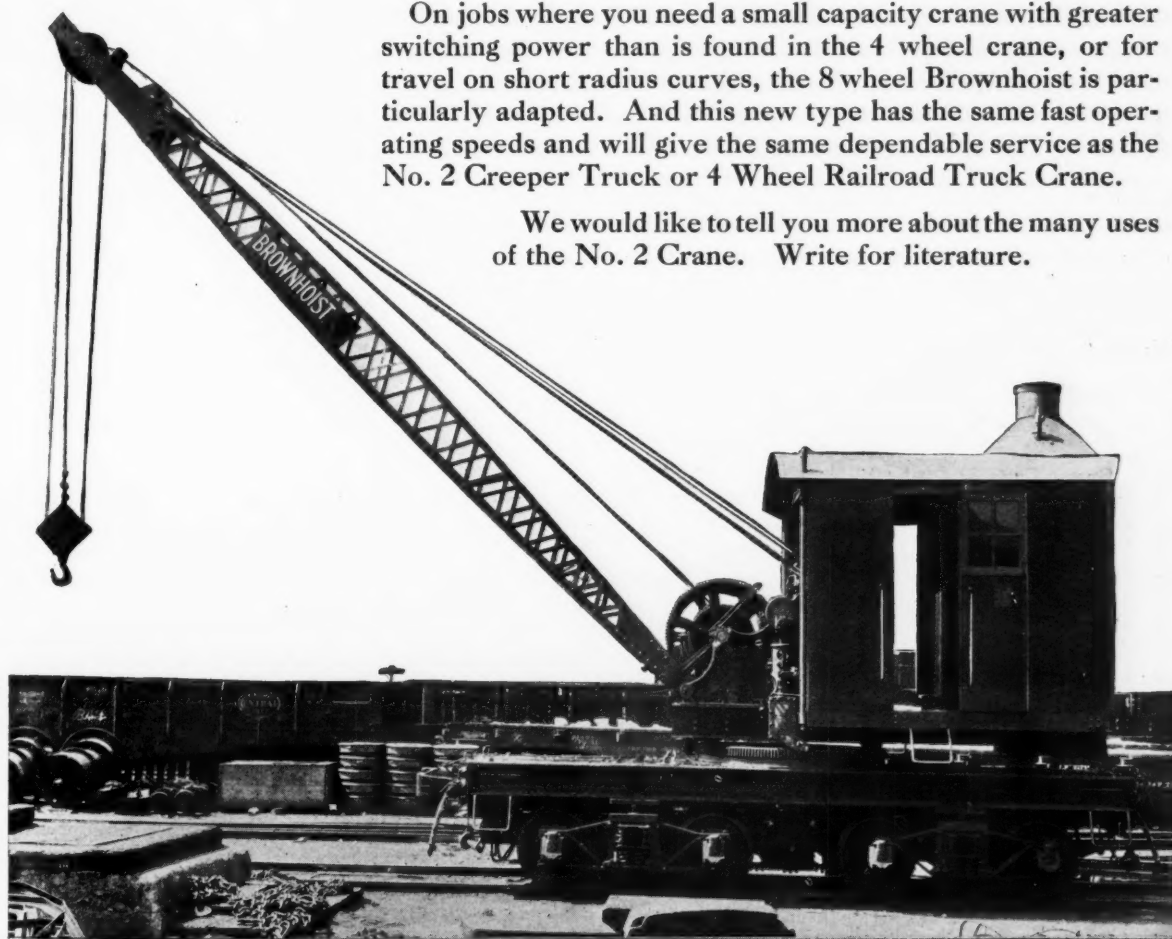
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